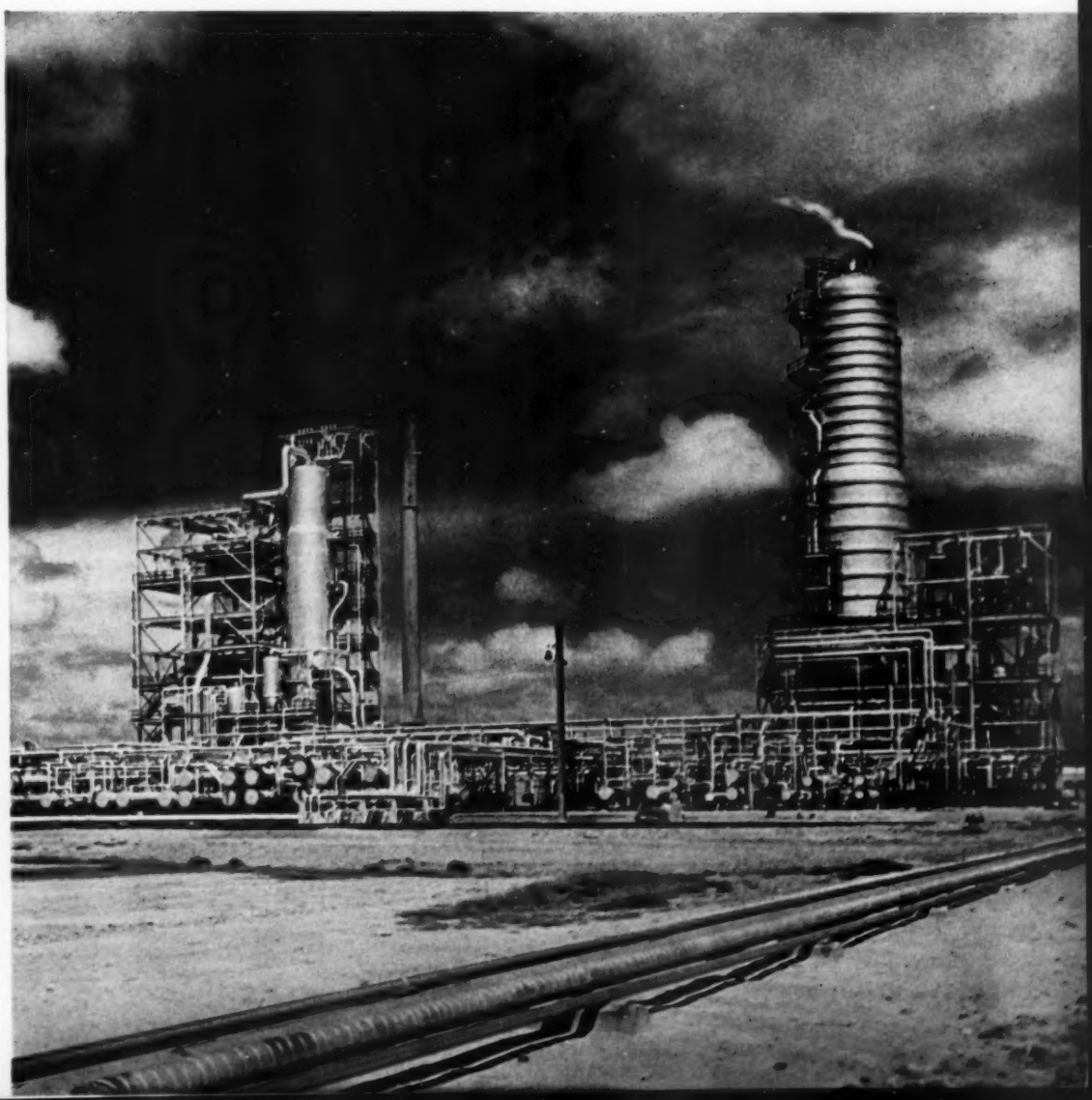
World Petroleum



FIVE DOLLARS PER YEAR FIFTY CENTS PER COPY

JUNE
1931

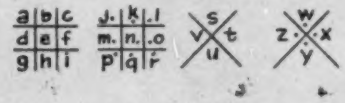
They may be Roadmaps to Riches!

The twin curves of a radioactivity well log are something like the treasure maps of romance . . . when interpreted, they may lead to buried wealth — if *they're accurate.*

Lane-Wells Radioactivity Well Logging gives you extremely accurate gamma ray and neutron curves for the excellent reason that the instruments are sensitive to even the smallest significant changes in the formations traversed. And extensive experience in every oil field has proved that the Lane-Wells curves are repeatable, and therefore dependable.

The experience gained in more than 30,000 Radioactivity Well Logs enables Lane-Wells men to give you expert aid, if requested, in interpreting your log — aid which is helpful particularly where local conditions cause unusual responses in the curves. This experience, coupled with the extreme accuracy and dependability of the log, is the reason why most experienced operators agree that, in either cased or open hole, you'll get the best results with

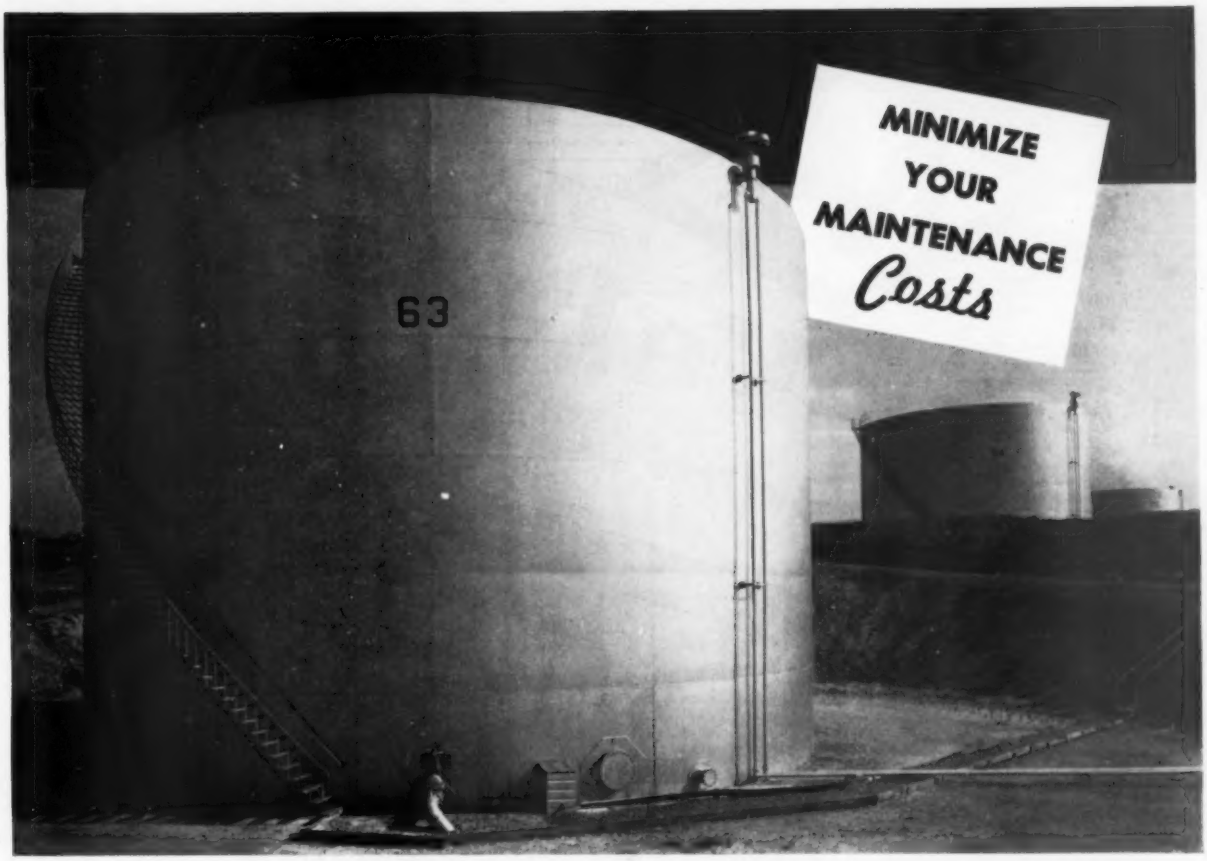
*This message is written in the once-popular "pig-pen" cipher, constructed like this:



General Offices, Export Office and Plant • 5610 So. Soto St. Los Angeles 58, California

Los Angeles • Houston • Oklahoma City
Lane-Wells Canadian Co. in Canada
Petro-Tech Service Co. in Venezuela

AR-402



Specify the PHOSCOTE PROCESS when ordering HORTON TANKS

The Phoscote Process is a modern, time-saving method of cleaning and preparing steel plates and shapes for painting. It removes mill scale and deposits a thin coat of iron phosphate on the surface of the metal to provide a better bond between the paint and steel. As a result, maintenance costs are substantially reduced and tank life is increased.

View showing a steel plate before being treated by the Phoscote Process.

The same steel plate after treatment by the Phoscote Process.

Many cone roof oil storage tanks have been treated by the Phoscote Process before erection. This process consists of:

(1) A warm sulphuric bath to remove mill scale.
(2) A clear water rinse to remove residual sulphates from the surface of the steel.
(3) A warm phosphoric acid bath where a thin coat of iron phosphate is deposited on the steel.
(4) A prime coat of paint, applied while the metal is still warm, to protect the cleaned surface.

After erection, the plates need only to be cleaned and patch painted before the final coats of paint are applied.

When you order Horton steel tanks, or any other Horton steel plate work—be sure to specify the Phoscote Process. Its many time and money savings advantages will more than repay you.

If you are interested in quotations or more information about the Phoscote Process — contact our nearest office. There is no obligation.

CHICAGO BRIDGE & IRON COMPANY

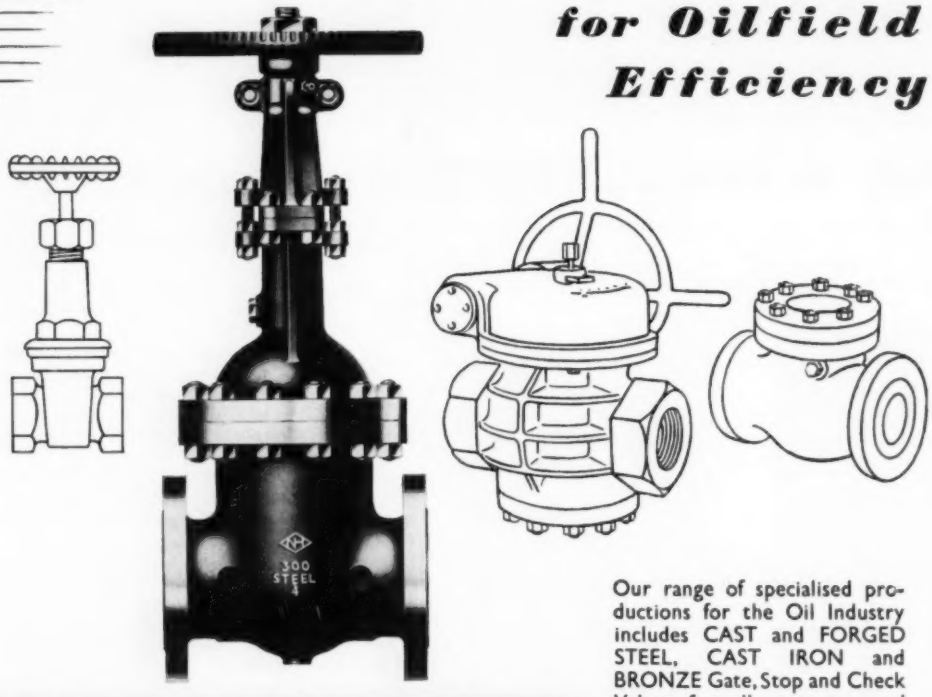
Chicago • Houston • Tulsa • San Francisco • Birmingham • Atlanta • Cleveland • Los Angeles • Salt Lake City • Boston • Seattle • Detroit • Washington
Plants: Birmingham, Chicago, Salt Lake City and Greenville, Pa., U.S.A. Export Office—165 Broadway Building, New York 6, N. Y., U.S.A.

REPRESENTATIVES AND LICENSEES

Ateliers et Chantiers de la Seine Maritime, Paris, France
Constructions Metalliques de Provence, Arles-sur-Rhone, France
Comprimo N.V., Amsterdam—O, Netherlands
Compagnia Tecnica Industrie Petroli, Rome, Italy
Chicago Bridge & Iron Company, Ltd., Apartado 1348, Caracas, Venezuela
Whessoe, Limited, Darlington, England
Motherwell Bridge & Engineering Company, Limited, Motherwell, Scotland
Horton Steel Works, Limited, Fort Erie, Ontario, Canada
W. P. Bryant, Edificio Abreu 402, Havana, Cuba
Sociedade Chicago de Construcoes Ltda., Rio de Janeiro, Brazil

Valves and fittings

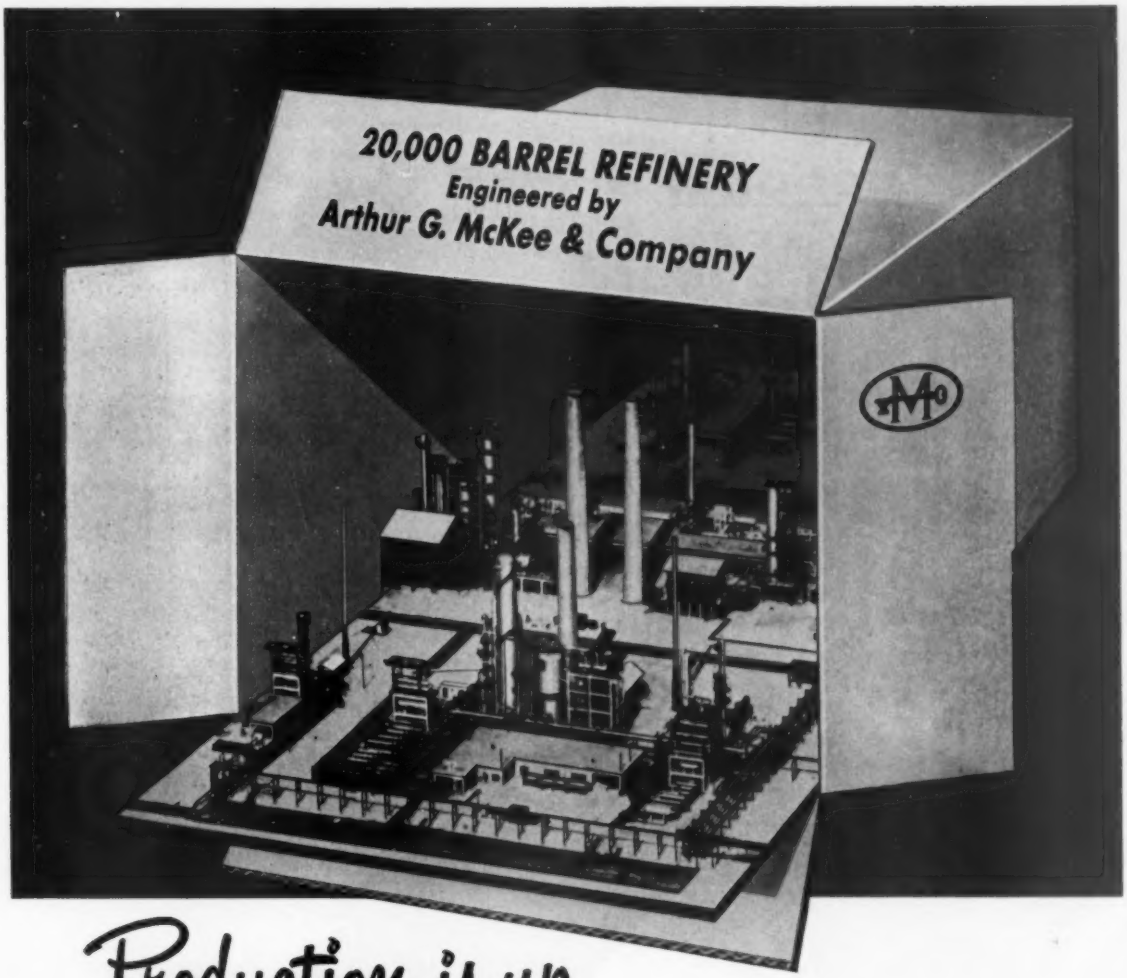
Designed & Developed for Oilfield Efficiency



Our range of specialised productions for the Oil Industry includes CAST and FORGED STEEL, CAST IRON and BRONZE Gate, Stop and Check Valves for all pressures and temperatures, for water, steam, oil, air and gas services.

Newman, Hender & Co. Ltd

WOODCHESTER GLOS. ENGLAND.



Production is up

ON NEW "TOOLS" FOR PETROLEUM REFINING

McKEE is engineering and constructing complete refineries, individual processing units and other refining facilities in many locations. The Refinery Division of this organization will continue to devote every effort toward keeping pace with the Refining Industry's expansion program.

DESIGN, ENGINEERING AND CONSTRUCTION FOR THE PETROLEUM REFINING AND IRON AND STEEL INDUSTRIES

McKee Engineering

Arthur G. McKee & Company • Established 1905

Headquarters: McKee Building, 2300 Chester Avenue, Cleveland 1, Ohio. *New York:* 30 Rockefeller Plaza, New York 20, N.Y. *Tulsa:* 918 First National Bank Building, Tulsa 3, Okla. *England:* The Iron and Steel Division of Arthur G. McKee & Company, is represented by Head, Wrightson & Co., Ltd.

Put national security aboard

Raw materials, food, manufactured articles . . . farms, cities, industries and people . . . all depend on sound hauling facilities. Every day finds a greater need for farther and faster transportation.

Trucks assume responsibility for an ever-increasing share of all cargoes that must be handled. They are vital to the *physical and economic security* of individual communities and entire nations!

Consider your transport facilities on a national basis, or in relation to your own immediate hauling requirements. Either way, the dependability, economy and performance of International Trucks will serve you well. They are built in sizes ranging from two to forty tons gross vehicle weight, for every kind of cargo and for travel over every type of road, highway or terrain. International Harvester Export Company, 180 N. Michigan Avenue, Chicago 1, U.S.A.

Better Living through Better Roads

INTERNATIONAL

INTERNATIONAL HARVESTER

BUILDER OF ESSENTIAL EQUIPMENT FOR ESSENTIAL WORK

McCormick International Farm Equipment • International Trucks • International Industrial Power • International Harvester Refrigeration

DROP FORGED STEEL
VALVES

DIKKERS
HENGELO-HOLLAND
Valve makers since 1879

WORLD PETROLEUM for June, 1951. Vol. 22, No. 6, June, 1951. WORLD PETROLEUM is published monthly by Mona Palmer, Trustee under the will of Russell Palmer, 2 West 45th St., New York 19, N. Y. Acceptance at East Stroudsburg, Pa., under Section 34.64 P. L. & R. Authorized. Subscription rate: $5.00 per year, single copies 50c.

SUPERIOR PERFORMANCE THROUGH UNIFORM QUALITY

Uniformity in physical characteristics and chemical purity increases operation efficiency of synthetic fluid-type cracking catalysts. Rigid production controls . . . years of experience as a leading producer of catalysts insures the uniformity of Davison Catalysts. Your requirements can now be supplied in either microspheroidal (M-S*) or ground (DA-1*) form... both available in various average particle sizes. Davison also offers development and production of catalysts to meet specific processes.

*T.M.T.D.C.C.

Progress through Chemistry

THE DAVISON CHEMICAL CORPORATION

Baltimore 3, Maryland

PRODUCERS OF: CATALYSTS, INORGANIC ACIDS, PHOSPHATES, PHOSPHATE ROCK, SILICA GELS, SILICOFLUORIDES AND FERTILIZERS

Switching to TIMKEN® tubing saved 14% on this part!

THE cost of this automotive part was $150.90 per thousand when made from bar stock. When the manufacturer switched to Timken® seamless tubing, he was able to use boring tools in place of twist drills and to increase speed and feeds. This resulted in producing 144 pieces per hour instead of only 96, with the savings shown here:

COST FIGURES TELL THE STORY

	BAR STOCK	TIMKEN TUBING
Material cost per 1000 pieces . . .	$ 83.19	$ 84.71*
Machining cost per 1000 pieces (6 spindle 2⅝" capacity automatic screw machine with estimated operating cost of $6.50 per hour)	$ 67.71	$ 45.14
TOTAL COST . . .	$150.90	$129.85

Total with bar stock $150.90

Total with Timken tubing . $129.85

SAVING . . . . . $ 21.05 (14%)

*In most cases, Timken seamless tubing is lower in cost than bar stock, foot for foot. In this instance, it was slightly higher because of the extremely great wall thickness.

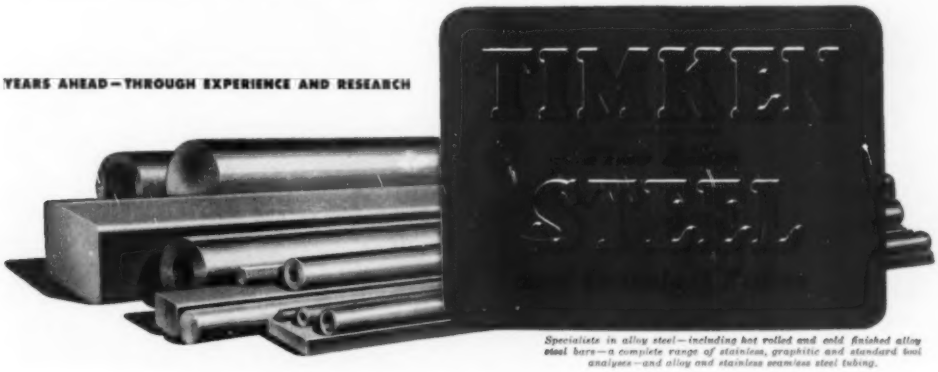
If you make a hollow cylindrical part, chances are you can save anywhere from 10 to 35% by switching from bar stock to Timken seamless tubing. Timken tubing eliminates drilling because the hole is already there. Finish boring is often your first production step. You have less stock to machine—less scrap loss. Machining cycles can be shorter, speeds and feeds increased.

And since the piercing process by which Timken seamless tubing is made is basically a forging operation, you get fine forged quality in your hollow parts. From tube to tube, and from heat to heat this fine forged quality is always uniform because of our rigid quality control.

USE OUR TUBE ENGINEERING SERVICE

Our Tube Engineering Service helps you select the most economical tube size for your job, guaranteed to clean up. With the tube we specify, you waste no time or material machining away excessive stock. Yet, you're sure of enough metal to fill out your dimensions. For an analysis of your requirements, write The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH



Specialists in alloy steel—including hot rolled and cold finished alloy steel bars—a complete range of stainless, graphitic and standard tool analyses—and alloy and stainless seamless steel tubing.

SCIP*

*** SHELL CORROSION INHIBITOR PROCESS**
(patented)

Banishes corrosion from product pipe lines

This booklet tells all about SCIP. Mail coupon for your copy.

- **PREVENTS CORROSION ON NEW LINES**
- **CLEARS SCALE FROM OLD LINES**
- **MAINTAINS FULL CAPACITY FLOW**
- **HAS NO EFFECT ON PIPED PRODUCTS**
- **SURE PROTECTION AT LOWEST COST!**

Products amounting to *many millions of barrel-miles per day* are now transported at full capacity in pipe lines kept free from scale by SCIP. The dollars-and-cents savings pay for a SCIP installation many times over in the course of a year's operation. If your lines are not delivering full capacity because of corrosion, be sure to fill out and mail the coupon for Shell's booklet, "SCIP, The Liquid Go-Devil."

Shell Development Company, Incorporated
50 West 50th Street, New York 20, N. Y.
Please send me a copy of "Scip—The Liquid Go-Devil."

Name_____

Company_____

Address_____

City_____ State_____

SHELL

SHELL DEVELOPMENT COMPANY

50 West 50th Street · New York 20, N. Y.

STEELS . for the Petroleum Industry
This organisation has made a special study of steel requirements of the petroleum industry: plates for fusion welded vessels; constructional steel; forgings; alloy steels, including corrosion and heat-resisting types; etc.
The Technical Departments will be pleased to discuss specific applications with manufacturers of petroleum equipment.
THE UNITED STEEL COMPANIES LTD
THE UNITED STEEL COMPANIES LIMITED OF SHEFFIELD ENG
THE LARGEST STEEL PRODUCERS IN THE BRITISH COMMONWEALT

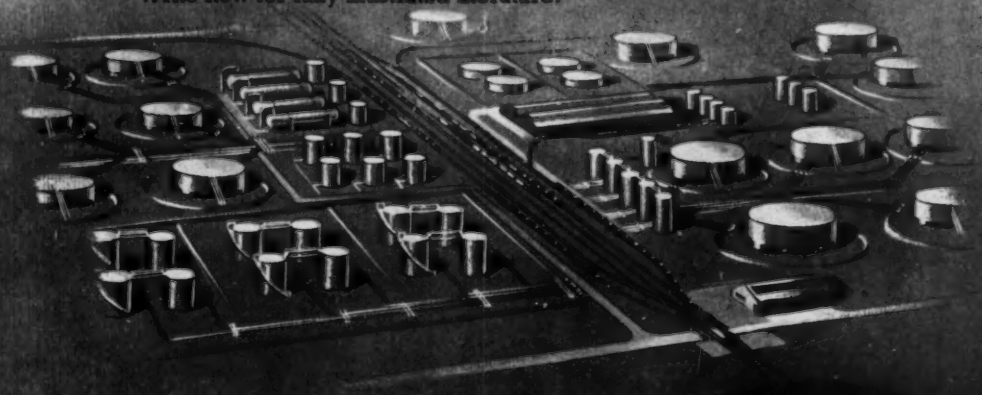
Ⓡ US 39

Every Oil Tank Installation Engineer knows . . .

that he is faced at every turn by the most dangerous fire risks, involving highly inflammable liquids and vapours. His is a great responsibility that can be alleviated by adequate fire fighting equipment of the right kind. The range of "PYRENE" Fire Appliances for oil storage depots and refineries is designed to give complete protection in the form of fixed mechanical foam installations and/or heavy duty motor-driven foam tenders, for bulk storage tanks; portable foam branchpipes and foam generators for smaller storage risks and spillage fires and hand fire extinguishers using chemical foam, CO_2, special liquids and the new CO_2—Dry Chemical.

Our Fire Engineers and Research Chemists are in a position to give you, without any obligation, the benefit of nearly 40 years specialised experience in fighting oil and spirit fires.

Write now for fully illustrated literature.

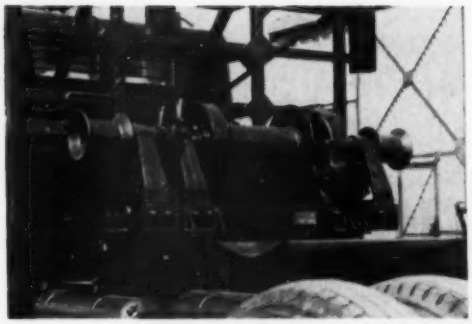


THE BEST KNOWN NAME IN FIRE PROTECTION

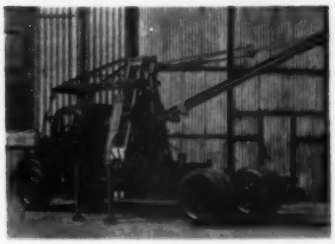
Pyrene TRADE MARK FIRE APPLIANCES

Write at once for full details to Dept. WP5 THE PYRENE COMPANY LIMITED, 9, GROSVENOR GARDENS, LONDON, ENGLAND

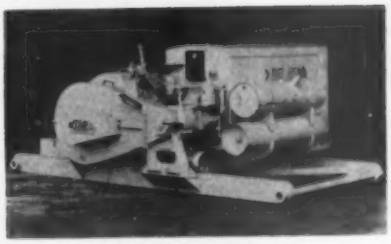
Associated with Pyrene Manufacturing Company, Newark, New Jersey, U. S. A.



THORNYCROFT 'ANTAR' VEHICLE WITH WOODFIELD SENIOR WINCH AS SUPPLIED TO IRAQ PETROLEUM CO. LTD. FOR PIPELAYING IN MIDDLE EAST.



4000-LB. TRUCK CRANE



WIRE LINE CORING REEL FOR TAKING CORES AT 15000 FT. DEPTH

W7 WELL SERVICING HOIST OPERATING IN VENEZUELAN OILFIELDS

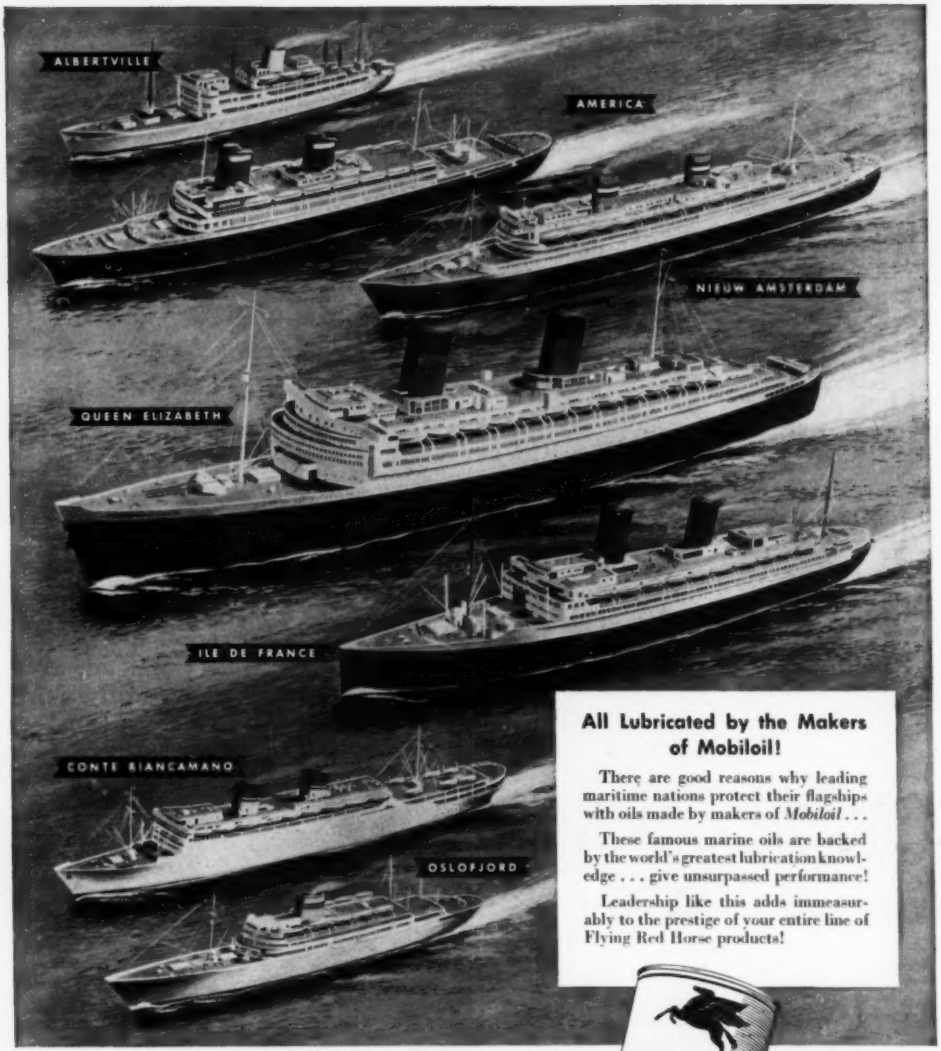
W4S WITH 60 000 LB. MAST FOR 4000 FT. WELLS REPRESENTING LATEST PRACTICE IN SERVICING RIGS, 1951

W7A SERVICING HOIST FOR OPERATION AT PRODUCTION DERRICKS FOR WELLS UP TO 7000 FT.

W4S SERVICING RIG IN TRAVELLING POSITION

Incorporating
The Kenworthy Jig & Press Tool Co.
London

First With the Flagships



All Lubricated by the Makers of Mobiloil!

There are good reasons why leading maritime nations protect their flagships with oils made by makers of *Mobiloil* . . .

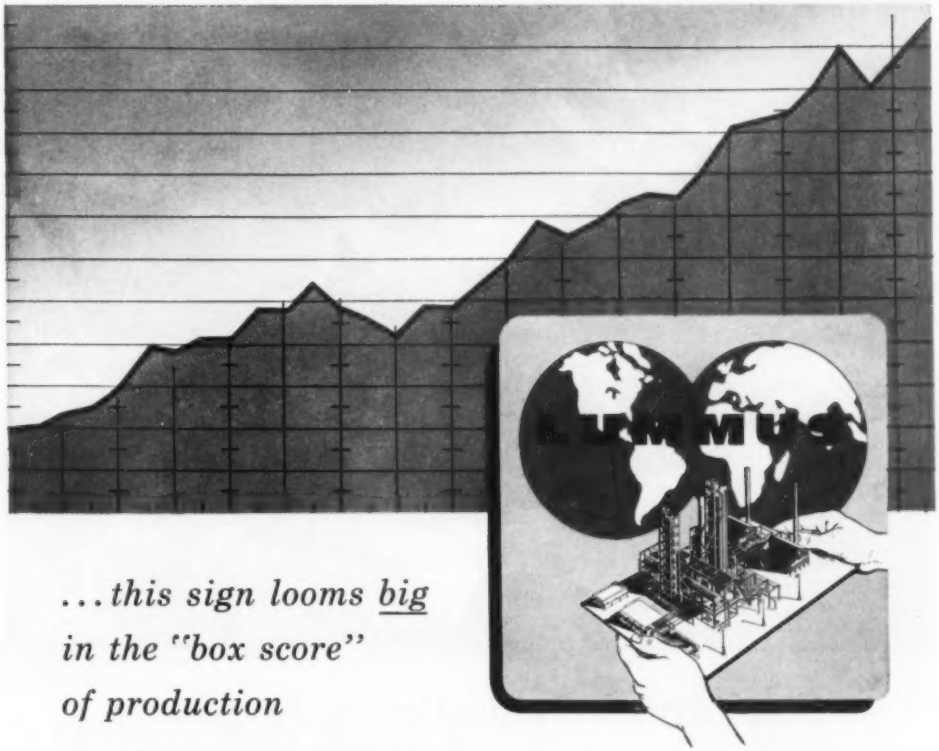
These famous marine oils are backed by the world's greatest lubrication knowledge . . . give unsurpassed performance!

Leadership like this adds immeasurably to the prestige of your entire line of Flying Red Horse products!

Now More than Ever—it Pays to Sell the World's Best Seller!

Mobiloil

SOCONY-VACUUM OIL CO., INC., and Affiliates: MAGNOLIA PETROLEUM CO., GENERAL PETROLEUM CORP.



. . . this sign looms big in the "box score" of production

For better than sixty years the Lummus sign has meant *excellence* in the designing, engineering and constructing of petroleum refineries and chemical plants. It means the same today. And you need take only a short mental jump to see its importance in the days ahead, as oil refiners and chemical producers are called upon to break and re-break production records.

Let's look at a partial "box score" of Lummus' current contributions toward these world-wide objectives. In the U. S. and abroad, Lummus is engaged in seven catalytic cracking projects—as well as in providing alkylation facilities —to meet the record-breaking demand for superior aviation and motor fuels.

Lummus currently has seven ethylene units "on the go" in Europe and the U. S.—plants which will operate with telling effect in supplying a vital basic raw material. One project—the Gulf Oil Corporation unit at Port Arthur, Texas—is the world's largest ethylene unit. It will produce nearly 2½ billion cubic feet yearly, increasing total U. S. production of ethylene by about 12%.

Isn't this a reassuring record for you to tie to? It strongly suggests that you think of Lummus first in your plans for petroleum refinery or chemical plant expansion.

THE LUMMUS COMPANY

385 MADISON AVENUE, NEW YORK 17, N. Y.

HOUSTON • CHICAGO • LONDON • PARIS • CARACAS

DESIGNING ENGINEERS AND CONSTRUCTORS FOR THE PETROLEUM AND CHEMICAL INDUSTRIES

Steel saved civilization at Augsburg

FOR 2000 years, the western world has survived vast waves of Asiatic invaders who threatened to destroy it. Repeatedly, the fate of civilization and Christianity has seemed to hang on the outcome of a single battle.

Such a decisive action was fought at Augsburg, South Germany, in 955 A.D. Swarming out of Asia, savage Magyars overran the rich Danube Valley. They ravaged the prosperous lands of Germany, Italy and France. At last, under Otto, King of Saxony, the armored Knights of Christendom rallied. They faced a hundred thousand fierce foes. The battle raged all day. Thousands were slain. At last the tide turned and the Magyars fled. For three days the Knights pursued the scattered enemy, killing or capturing thousands more. Symbolic of the west's predominance in weapons and armor of iron and steel, victory was credited to King Otto's iron-tipped Holy Lance.

Augsburg ended the Magyars' attempts to conquer Europe. They settled down to peaceful living in their valley and within 50 years accepted Christianity. Again, history demonstrated the truism that no people or alliance can establish supremacy unless it first predominates in the production and use of iron and steel.

It is reassuring that America produces twice as much steel as the rest of the world combined. America has the steel to win. We will use enough of it to protect our leadership of a free Christian world.

Scrap Metal is Critical Again

The Youngstown Sheet and Tube Company

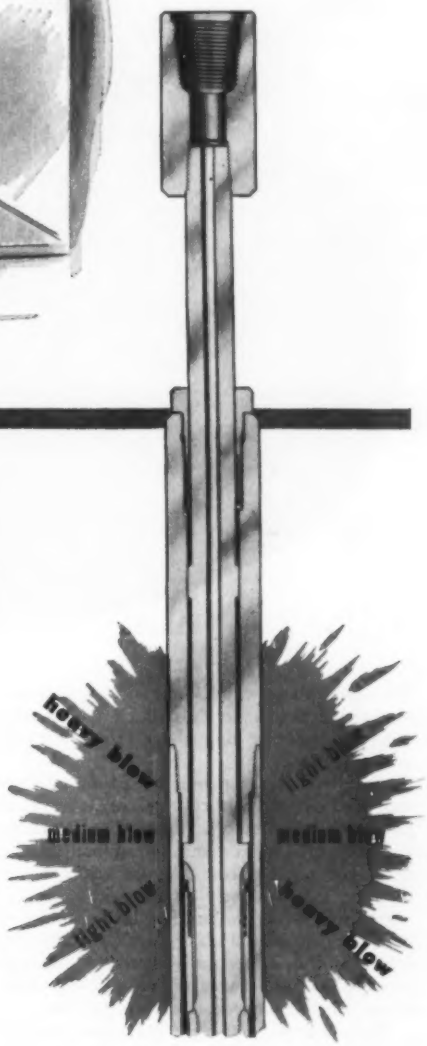
General Offices--Youngstown 1, Ohio
Export Offices--500 Fifth Avenue, New York

MANUFACTURERS OF CARBON ALLOY AND YOLOY STEELS

The steel industry is using all its resources to produce more steel, but it needs your help and needs it now. Turn in your scrap, through your regular sources, at the earliest possible moment.

The right jar
for the job at hand

Jarring Jerry



THE JOHNSTON-SUTLIFF HYDRAULIC JAR

A Jar that hits any desired blow, at any time, to meet any condition—without pulling out of the hole.

Write For Descriptive Literature!

JOHNSTON

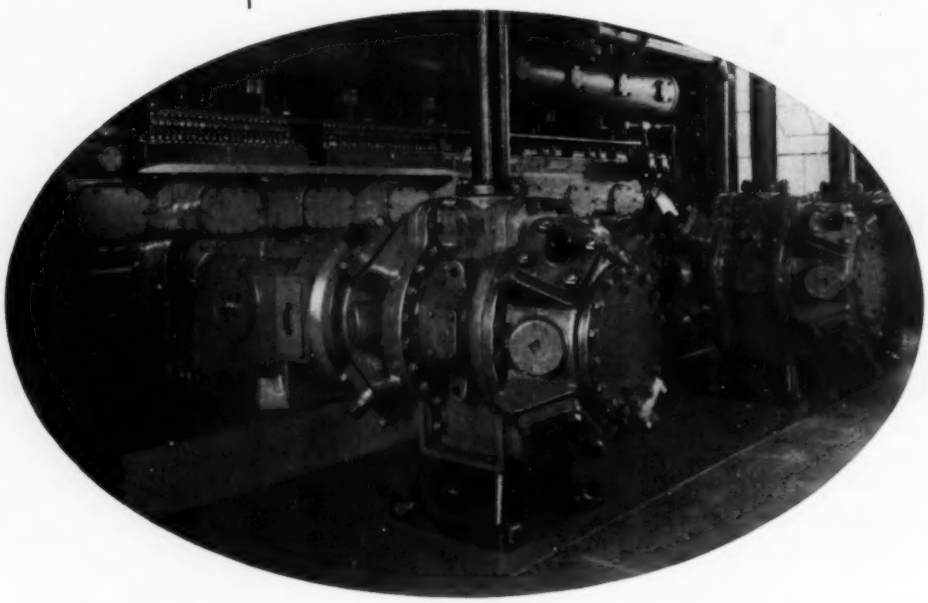
SHOOT TEST

M. O. JOHNSTON OIL FIELD EXPORT CORPORATION

3035 ANDRITA STREET—LOS ANGELES 65, CALIFORNIA

"Exclusive Export Sales"

Insure dependable performance
of pipe-line compressor units,
reduce maintenance costs
with **Gulf Security Oil**



You make a two-way savings when your pipe-line compressor units are lubricated with Gulf Security Oil—lower maintenance costs, less out-of-service time.

Gulf Security Oil provides outstanding protection for bearings and cylinder walls in both engines and compressors. After years of operation with this quality lubricant, equipment shows remarkable freedom from cylinder wear and a minimum of carbon deposits on valves and rings.

Because of its excellent resistance to oxidation, Gulf Security Oil stands up for many hundreds of hours without appreciable change in its original properties. And because oil control rings are kept clean, oil consumption is remarkably low.

Many operators of units lubricated with Gulf Security Oil report that this quality oil insures more operating hours between overhauls and helps them avoid unscheduled shutdowns. And Gulf's delivery service is tailored to meet the needs of every pipe-line operator.

For complete information on Gulf Security Oil and for expert help on any lubrication problem, call in a Gulf Lubrication Engineer today. Write, wire, or phone your nearest Gulf office. Gulf Oil Corporation · Gulf Refining Company, Gulf Building, Pittsburgh 30, Pa.

FIFTY YEARS OF SERVICE
1901 GULF 1951
PETROLEUM AND ITS PRODUCTS

SERVICE LEDGER
1901-1951

- ANGLO-IRANIAN OIL CO. LTD.
- ARGENTINE GOVERNMENT OIL FIELDS
- ARGENTINE MINISTRY OF WAR
- ATLANTIC REFINING CO.
- ATOMIC ENERGY COMMISSION
- BRITISH AMERICAN OIL CO. LTD.
- CANADIAN OIL REFINERIES, LTD.
- CALIFORNIA REFINING CO.
- CHAMPLIN REFINING CO.
- CIE. DE RAFFINAGE SHELL-BERRE
- CIE. FRANCAISE DE RAFFINAGE
- CIE. INDUSTRIELLE DES PETROLES
- CITIES SERVICE OIL CO.
- CITIES SERVICE REFINING CORP.
- COLGATE-PALMOLIVE-PEET
- CONSOLIDATED REFINERIES, LTD.
- CONTINENTAL OIL CO.
- CORY BROTHERS & CO., LTD.
- CREOLE PETROLEUM CORP.
- DIAKEL CORPORATION
- EL DORADO REFINING CO.
- ESSO STANDARD OIL CO.
- GENERAL PETROLEUM CORP. OF CALIFORNIA
- GLOBE OIL & REFINING CO.
- GULF OIL CORP.
- HUMBLE OIL & REFINING CO.
- IMPERIAL CHEMICAL INDUSTRIES
- IMPERIAL OIL LTD.
- KANOTEX REFINING CO.
- KENDALL REFINING CO.
- LEVER BROS.
- LION OIL CO.
- MAGNOLIA PETROLEUM CO.
- MARINE OIL REFINERS OF AFRICA, LTD.
- MATHIESON CHEMICAL CORP.
- McCOLL-FRONTENAC OIL CO., LTD.
- MID-CONTINENT PETROLEUM CORP.
- MITSUBISHI OIL CO., LTD.
- NATIONAL PETROLEUM COUNCIL OF BRAZIL
- PAN AMERICAN REFINING CORP.
- PENNZOIL CO.
- PHILLIPS PETROLEUM CO.
- POLYMER CORP., LTD.
- PURE OIL CO.
- SHELL CHEMICAL CORP.
- SHELL OIL CO.
- SHERWIN-WILLIAMS CO.
- SINCLAIR REFINING CO.
- SKELLY OIL CO.
- SOCIETE DES RAFFINERIES DE PETROLE DE LA GIRONDE
- SOCIETE GENERALE DES HUILES DE PETROLE
- SOCIETE INDUSTRIELLE BELGE DES PETROLES
- SOCONY-VACUUM FRANCAISE
- SOCONY-VACUUM OIL CO.
- E. R. SQUIBB & SONS
- STANDARD OIL CO. (INDIANA)
- STANDARD OIL CO. (OHIO)
- STANDARD OIL CO. OF CALIFORNIA
- SWIFT AND CO.
- TEXAS CO.
- UNION OIL CO. OF CALIFORNIA
- UTAH OIL REFINING CO.
- WASATCH OIL CO.
- WOOD RIVER OIL & REFINING CO.

From Abadan to Llandarcy...with AIOC!

In its twenty year association with the Anglo-Iranian Oil Co., Ltd., Kellogg has undertaken the design and construction of more than forty process units.

From the Persian Gulf to Wales and Scotland...from Palestine to France and England, these have run the process gamut from simple pipe stills to the most advanced Fluid catalytic crackers. The list embraces alkylation and isomerization units, phosphoric acid treaters, thermal crackers and reformers . . . as well as many primary fractionation units.

Currently, Kellogg is engaged in the construction of three Fluid catalytic cracking units for AIOC, one each in Grangemouth (Scotland), Kent (England), and Llandarcy (Wales).

THE M. W. KELLOGG COMPANY

A SUBSIDIARY OF PULLMAN INCORPORATED

for fifty years an integral part of processing history

NEW YORK · JERSEY CITY · LOS ANGELES · TULSA · HOUSTON · TORONTO · LONDON · PARIS

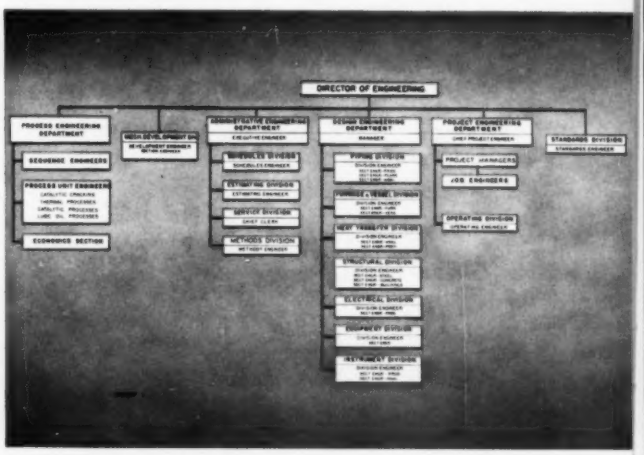
Portrait at

This year is Kellogg's fiftieth of service to industry. At this time naturally, as a group of men—known collectively to the modern business world as The M. W. Kellogg Company—we can think back nostalgically. We can remember the chimney stacks

"Details by the Million"

Previous camera "portraits" of M. W. Kellogg today, appearing in this publication, have described the broad outline of the development phases of the Kellogg operation and have pointed out how the results of these diversified efforts are channeled to the industry through Process Engineering.

This month, some aspects of Kellogg's Design Engineering Department are examined to illustrate how "details by the million" are marshalled into final working plans.



1. ***TO HANDLE THE DETAILED*** engineering of one refinery unit requires a diverse staff of engineers and a corps of draftsmen. To handle *20 or 30 such jobs simultaneously* calls for a veritable "army" of technical personnel. This chart shows how the company's Engineering Departments are organized. The focal point of administrative and quality control is the Director of Engineering.

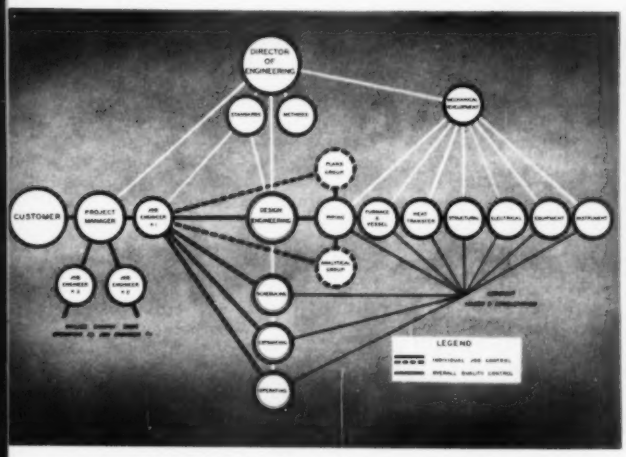
4. ***WITH THE CUSTOMER'S APPROVAL*** of plot plans, piping layouts, elevations, utility plans and materials specification in hand, detailed engineering of all phases of a unit can proceed simultaneously. And it does at Kellogg because of the vast technical man-power pool. Above is pictured the north side of one entire floor of the company's offices devoted to *piping* engineering alone.

5. ***THIS IS THE EAST SIDE OF*** the same *piping engineering* floor . . .

Fifty... no. 5

we built in 1901 . . . the first crude vessels for oil refiners in the 'teens . . . our first combination unit. The forty-odd Fluid cat crackers built in these years. But, after all, The M. W. Kellogg Company is only a factor as it is able to serve industry today. For that reason, we are presenting this series of monthly camera studies which document our belief that a truly integrated organization can better serve industry to achieve greater earning power. This is No. 5 in the series.

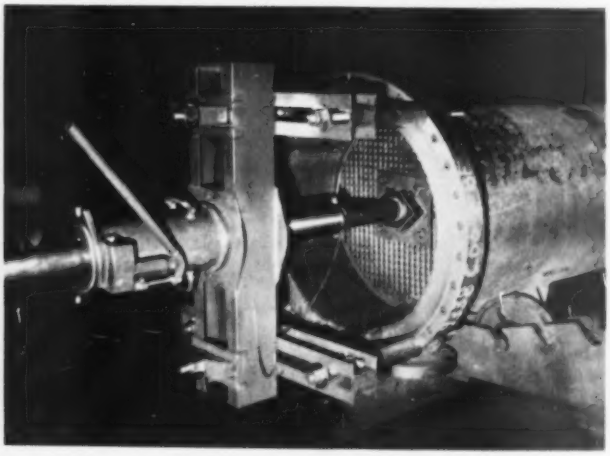
M KELLOGG W
1901-1951
50th Anniversary



2. ***SUCH VERTICAL CONTROL*** insures top technical performance within the various technical specialties—but individual job performance and delivery require a different type of control. The above diagram indicates how horizontal control of individual jobs is achieved—bringing to each job the combined facilities of the entire organization. The apex of this control is the *Project Manager* of each individual job.

3. ***FIRST STEP*** in every project is its assignment to a Project Manager, who assumes overall responsibility. After receiving process data, the Project Manager, assisted by a *Job Engineer*, establishes specifications and then turns the project over to the *Plans* (pictured) and *Analytical Groups*. These latter establish within narrow limits all major engineering details of the proposed plant prior to the start of any detailed engineering.

6. ***. . . AND HERE IS THE SOUTH SIDE.*** All of these trained men specialize in just one phase of refinery engineering . . . *piping*. In total, mechanical design engineering personnel alone occupy some 30,000 square feet of space.



7. ***IN THE ENGINEERING DEPARTMENT***, there is a special group of engineers which does nothing else but concentrate on mechanical development problems posed by the various specialized engineering sections. New types of valves, completely new hydraulic exchanger-bundle pullers (illustrated), new types of piping supports, are but a few of the improvements that have come from this group.

NEXT MONTH

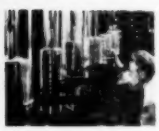
. . . in the sixth in this series of camera studies of M. W. Kellogg today . . . you will glimpse a few of the many supporting groups and special devices that Kellogg uses to get the most out of its Design Engineering talent.

The proper bevel for the perfect weld!

M. W. KELLOGG

There's no particular trick to cutting a nozzle hole in a vessel when its location has been clearly indicated by a qualified layout man. But there is quite a trick to cutting these holes with the proper bevel to produce a perfect welded joint when the nozzle is attached. Perfection in such details is why "Kellogg-fabrication" is specified for the industry's more important vessel orders.

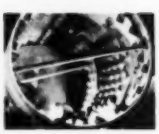
- Pressure Vessels
- Vacuum Vessels
- Fractionating Columns
- Drums and Shells
- Heat Exchangers
- Process Piping
- Hi-pressure—Hi-temp Power Piping
- Bends and Headers
- Giant One-Piece Bends
- Forged and Welded Fittings
- Radial Brick Chimneys



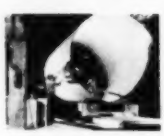
Continuing Study of behavior of metals under stress at high temperatures has produced valuable design data.

Shop Layout Craftsmen are fully experienced in vessel fabrication from nozzle positioning to "knockdown" fabrication for field assembly.

Extensive Facilities from forming of plate to final machining of precision surfaces permit complete fabrication under the same roof.



Special Welding Techniques and stress relieving methods assure equipment performance even under severest operating conditions.



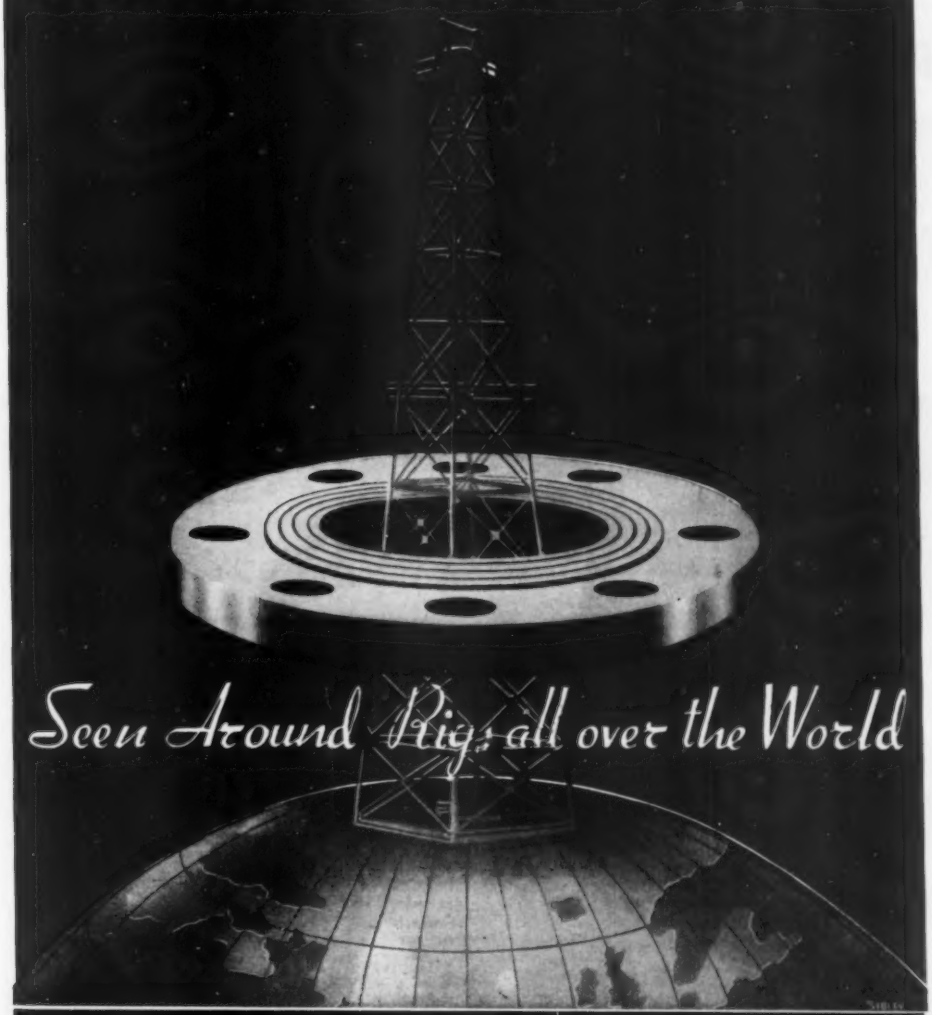
Rigid Quality Control, devised by specialists, including chemical and micro analyses as well as mechanical and non-destructive testing.

NEWS FOR OPERATORS IN WESTERN CANADA!

The Canadian Kellogg Company Ltd. has established complete shop facilities for the fabrication of all types of piping at **EDMONTON**, Alberta. Inquire directly or through any Kellogg or Canadian Kellogg office.

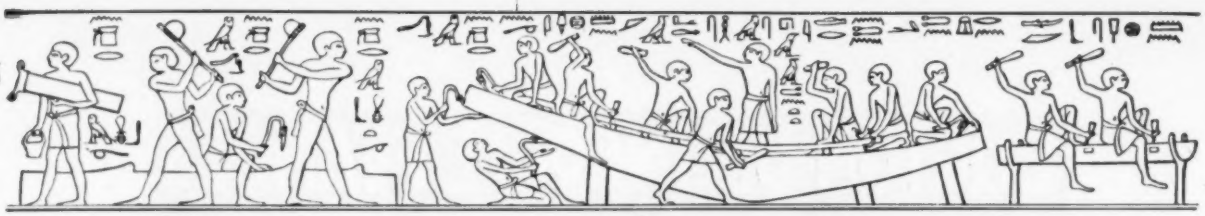
The M. W. Kellogg Company *(A Subsidiary of Pullman Incorporated)* **New York, Jersey City, Los Angeles, Tulsa, Houston, Toronto, London, Paris**

BURTON DELINGPOLE FLANGES



SOLID FORGED WELDLESS STEEL HIGH PRESSURE FLANGES

BURTON DELINGPOLE & CO. LTD. OLD HILL, STAFFS., ENGLAND
TELEPHONE : CRADLEY HEATH 6237-8 TELEGRAMS : STAMPINGS, CRADLEY HEATH



HIEROGLYPHICS · · · with a modern meaning

The workman of ancient Egypt knew the symbols of his trade. They helped him fashion stone and metal, wood and cloth, into the goods and structures which best served his era . . . The needs of our modern industrial civilization are different. Visitors to Sun Ship's mighty shops see in the making the intricate steel fabric of petroleum refineries and chemical plants . . . massive bubble towers, pressure vessels, condensers, cracking cases, and a vast array of special machinery and equipment for many industries.

But even a visitor from the days of Egypt's Pharaohs would recognize two familiar facts—that strange modern "hieroglyphics" guide precise assembly of today's steel behemoths . . . and that Sun Ship workers are masters in their knowledge of the symbols and crafts of their trades . . . The many modern industries served by Sun know these facts, too.

Illustration at top, reproduced from "The History of All Nations," shows ancient Egyptian shipbuilding as depicted on the tomb of Ti, at Sakkara. In contrast is the 55' regenerator being built by Sun.

Sun

SHIPBUILDING & DRY DOCK COMPANY

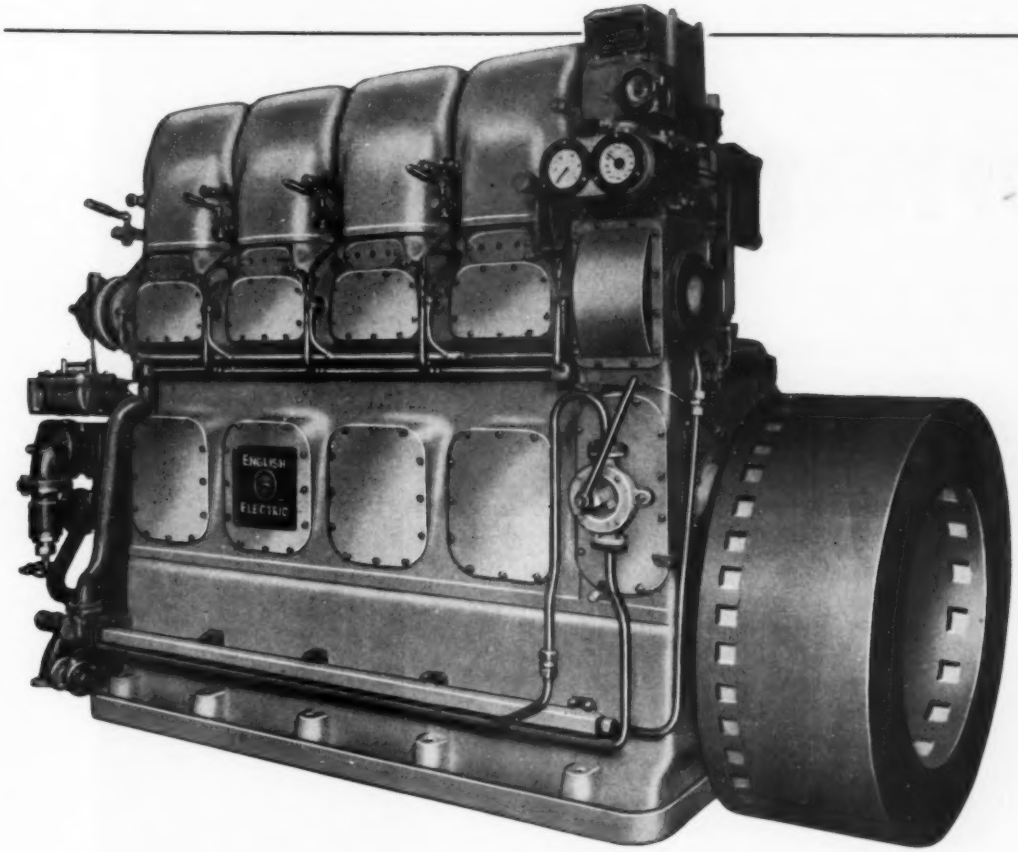
SINCE 1916

ON THE DELAWARE • CHESTER, PA.

25 BROADWAY · NEW YORK CITY

'ENGLISH ELECTRIC'

dual-fuel engines



Economical power from fuel-oil or gas.

Outputs from 132 b.h.p.

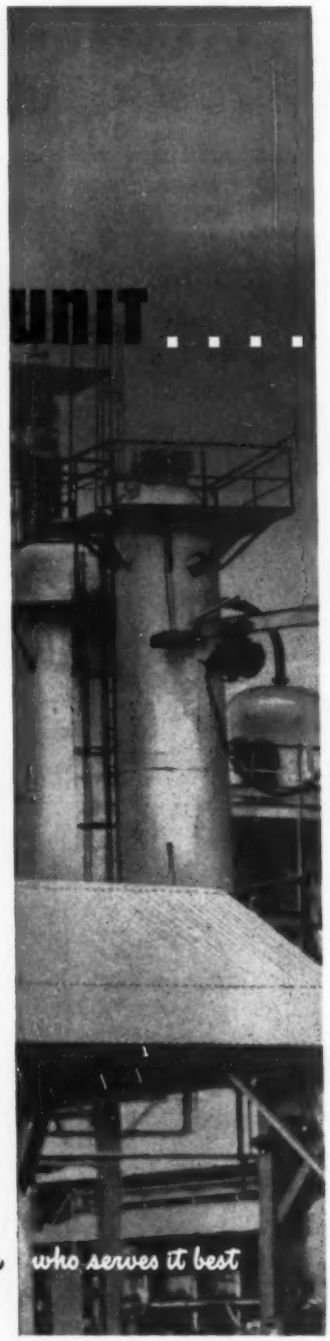
Running on Town, Natural, Producer or Sewage Gas (Methane), these units require the minimum quantity of fuel oil for pilot injection, and give the same output on gas of a high calorific value as on fuel oil. Changeover from gas to oil is automatic if gas supply fails.

The ENGLISH ELECTRIC Company Limited, Queens House, Kingsway, London, England.
Diesel Engine Division, Rugby.

Works: STAFFORD • PRESTON • RUGBY • BRADFORD • LIVERPOOL

DENo1e

UOP PLATFORMING unit . . . .



● The first UOP Platforming unit to be installed in Canada will be built at Canadian Oil Companies' new eighteen million dollar refinery now being constructed at Froomfield, Ontario.

Canadian Oil selected a 3800 barrel per day unit to produce high octane aviation gasoline components, chemicals important to the production of synthetic rubber, nylons and plastics, and for upgrading low octane natural and straight run gasolines.

This first Canadian installation is further evidence of the preference for Platforming—a fact that is fully substantiated by the number of units—ranging from 900 to 16,000 barrels per day—currently in various stages of design and construction for both major and independent refiners.

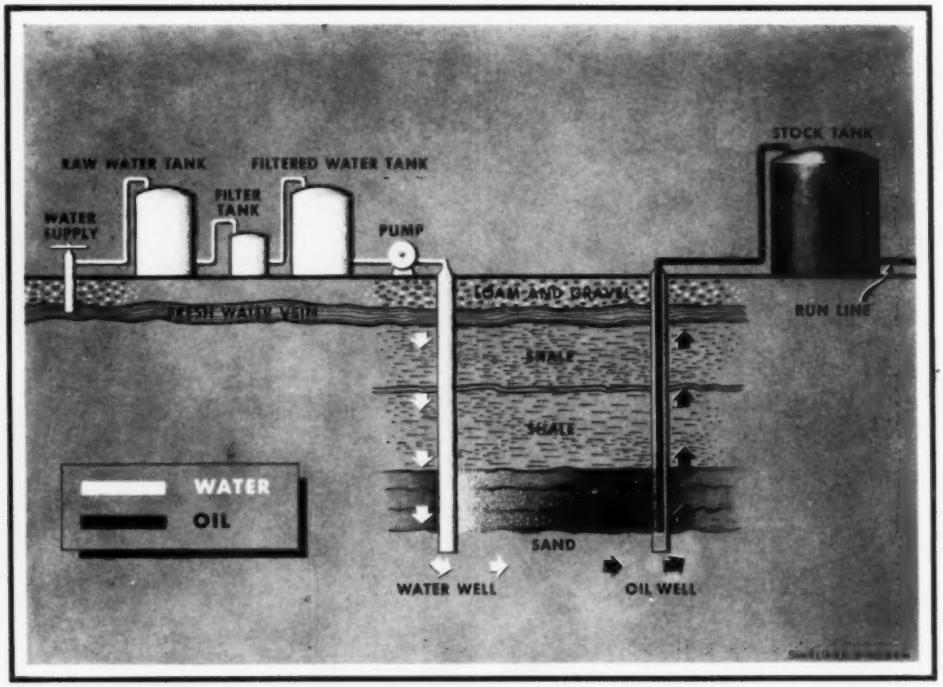
UNIVERSAL OIL PRODUCTS COMPANY

General Offices: 310 S. MICHIGAN AVE., CHICAGO 4, ILL., U.S.A.
Laboratories: RIVERSIDE, ILLINOIS

Universal Service Protects Your Refinery

The market belongs to the refiner who serves it best

. for Canadian Oil Companies Limited
WHITE
ROSE



THROUGH SINCLAIR RESEARCH—

Oil Wells Come Back to Life!

Oil wells that have reached their economic producing limits, come back to life again through new techniques which Sinclair research has helped develop. There is oil at the bottom of many such wells but, until recent years, it remained *"unrecoverable"* when natural underground pressure gave out.

Now Sinclair is getting many old wells to yield *up to three times* as much oil as they produced before, by scientific use of artificial pressures.

With oil so vital to America's progress — in peace or war — this secondary recovery program is important to all the people since it helps enlarge our national oil supply.

But, Sinclair is also on the march in *new* oil fields, investing $250,000,000 to develop added sources of crude oil. Here, Sinclair uses the most advanced methods to extract more oil the *first* time.

These are two more ways by which Sinclair is increasing its capacity to serve customers and the nation's need for oil, two more evidences of Sinclair progress; two more reasons why Sinclair is . . . *a great name in oil.*

SINCLAIR
A Great Name in Oil

SINCLAIR OIL CORPORATION • 630 FIFTH AVENUE • NEW YORK 20, N. Y.

WHITT AND CHAMBERS LTD

Specialists in Pressure Gauges and Pressure Recording. Valves, Forgings, and General Fittings

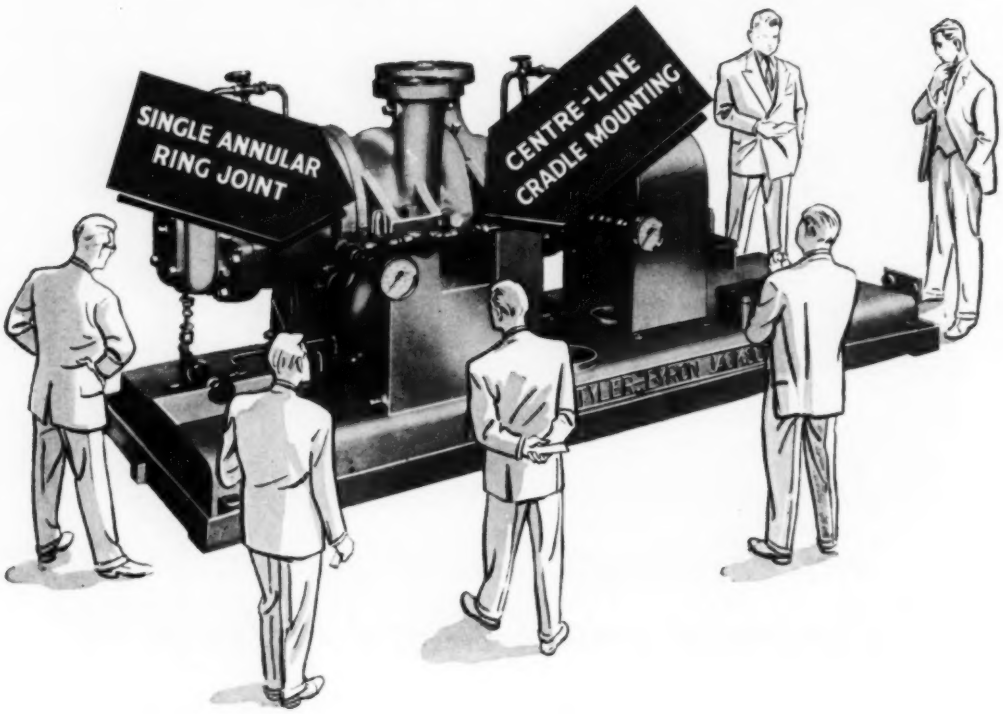
Your problems are our business and we welcome your enquiries. Our products have been developed for the most exacting conditions of present day practice in the Power Supply Industry, Marine, Oil and Chemical Worlds.

Phone: ABBey 3021
Grams: "WHITCHAM SOWEST LONDON"

OUR TECHNICAL STAFF WILL BE DELIGHTED TO HELP YOU— EITHER ON DESIGN OR ON METALS

BURWOOD HOUSE
CAXTON ST. LONDON S.W.I.
ENGLAND

These are sound engineering reasons



The special keynote of this Hayward Tyler-Byron Jackson "VC" pump is efficiency. A special purpose 2-stage centrifugal, it is designed specifically for Refinery service where high temperatures and high pressures are involved.

The vertically split case and cover with its fully trapped circular metallic enclosed gasket is certain to ensure a tight joint under high temperature and pressure. This joint is far more easy to make and maintain than the irregularly shaped flat gaskets used for horizontal split case joints. The entire rotating element may be removed for inspection without disturbing either suction or discharge piping.

Centre line cradle mounting permits thermal expansion in all directions under high temperature without misalignment.

General Specification: Capacities 200-5,000 Imp. gallons per minute. Heads up to 1,400 feet at speeds up to 3,600 r.p.m. Temperatures up to 900°F. Pressures to 1,000 p.s.i.g.

HAYWARD TYLER — BYRON JACKSON

HAYWARD TYLER & CO. LTD. LUTON. BEDFORDSHIRE · TELEPHONE LUTON 3951

WORLD PETROLEUM

The Management Publication of the International Petroleum Industry

MONA PALMER
Publisher

E. W. MAYO
Editor

J. C. CHATFIELD
Managing Editor

RICHARD SALA
Art Director

SUBSCRIPTIONS

Annual subscription $5.00 (U.S.) postpaid
Single copies 50 cents

GENERAL OFFICES

2 West 45th Street, New York 19
(Tel. MUrray Hill 2-7333)

BRANCH OFFICES

LONDON
E. H. Doddrell, 342, St. Paul's Corner, Ludgate Hill, London E.C. 4
(Tel. CITY 5318)

LOS ANGELES 14
W. S. Johnson, Western Advertising Manager, 412 West 6th Street
(Tel. Mutual 1391)

NEW YORK 19
E. L. Townsend, Eastern Advertising Manager, 2 West 45th Street
(Tel. MUrray Hill 2-7333)

TULSA 3
O. F. Cozier, Mid-Continental Advertising Manager, 515 McBirney Bldg.
(Tel. 4-5555)

World Petroleum is published by Mona Palmer, Trustee under the will of Russell Palmer.

CONTENTS FOR JUNE 1951 Vol. 22, No. 6

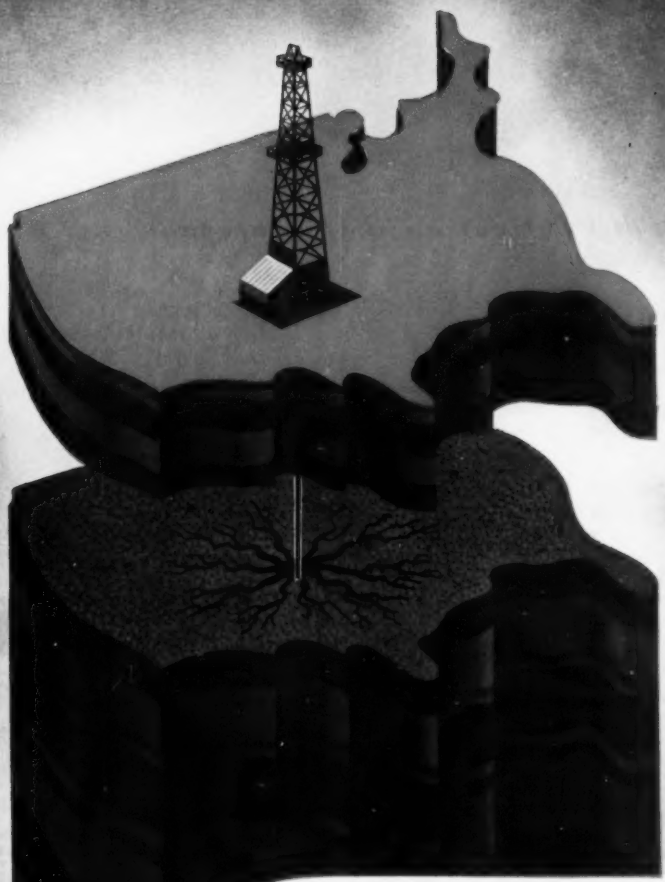
31 **Persia's Troubled Oil Situation**
32 **Nationalization in Persia**
36 **Sinclair Research Laboratories Invite Ideas For Development**
37 **Means of Replacing Iranian Oil is Studied by Defense Agency**
38 **Oil Profits Rise 23 Percent**
42 **Unusual Diesel-Electric Rig**
44 **Alkylation Plant Improvements**
48 **Effect of Pulsations in Gas Measurements**
50 **Progress of the French Search for Oil—The Lacq Field**
52 **Oil Conditions in Burma, India and Pakistan**
54 **New Catalytic Reforming Process is Announced by Houdry**
58 **Refining Shale Oil**
60 **International Notes**
64 **Oil Company Changes**
88 **Advertisers Index**

Member Of National Business Publications, Inc., and Controlled Circulation Audit, Inc.

THIS MONTH'S COVER

The kodachrome on the cover shows the new 63,000 bbl two stage crude distillation unit of the Creole Petroleum Corp. at Amuay Bay, Venezuela. Light products are removed from the crude in the atmospheric stage. Reduced crude comprising 60 percent of the raw charge is fractionated in the second stage column which operates under a vacuum of 51 mm Hg at the top. Mechanical design, engineering, and construction of this unit were provided by Foster Wheeler Corp. with process design furnished by Standard Oil Development Co. Color plates reproduced through courtesy of *Heat Engineering*, house magazine of Foster Wheeler Corp.

HALLIBURTON



HOWCO
IS "CRACKING" PRODUCTION RECORDS

A growing number of wells have responded with remarkable success to Howco's Hydrafrac service. There is no doubt but that well owners have available here a proved means of increasing production; with very profitable returns... Howco's Hydrafrac service is a method of hydraulically fracturing the producing formation, creating new and greater permeability within the zone being treated. This method was first used successfully in old wells to recover additional oil reserves and increase the production rate. Now it is also well established as a new completion method—and is more economical and convenient while the drilling rig is over the hole... Thorough analysis of your well by Howco will indicate whether or not Hydrafrac Service can help you crack production records. Telephone your nearest Howco representative.

HYDRAFRAC
SERVICE

"THERE'S NO SUBSTITUTE FOR EXPERIENCE IN OIL WELL CEMENTING"

HALLIBURTON OIL WELL CEMENTING CO.
DUNCAN OKLAHOMA

Persia's Troubled Oil Situation

AT a time when the world so urgently needs all the oil it can produce that the temporary shutdown of a single large refinery resulted in a pinch felt in markets thousands of miles distant, the action of the Persian Parliament in voting to seize the property of Anglo Iranian Oil Company and void its concession contains a threat of serious disturbance to the international oil industry. This, of course, is a consideration quite apart from the moral and legal question involved but it does illustrate the close-knit fabric of the international petroleum trade and shows how unsettling developments in one segment of the industry become of immediate concern to its other branches.

It is, perhaps, too early to determine the extent to which the action taken in Persia will be carried or whether it will spread to other areas, but the pattern followed by the agitators and the violence of their methods suggests that success in stopping the outflow of Persian oil will lead to similar attempts elsewhere.

The move for expropriation has no shred of legal support. The agreement signed by the government and the oil company in 1933 specifically provides for the settlement by arbitration of any dispute, one representative to be named by each party and these two to select a third. In case they fail to agree on this selection or if either side refuses to accept the arbitrators' decision the whole matter is to be referred to the Court of International Justice sitting at the Hague. This is the procedure which the company has called upon the Persian government to accept in the present juncture.

Nor is there any basis for the claim that the present agitation is due to refusal of the Anglo Iranian Oil Company to agree to a more liberal adjustment of terms by which the income from oil is divided between the government and the company. As far back as 1948 discussions were begun between representatives of the government and the company looking to a revision of the existing contract. These discussions led to the formation of a supplemental agreement the effect of which would have been to increase company payments by 50 percent or more. This agreement, signed by the Persian Premier, was subject to approval by the Parliament but though frequently debated it was not acted upon until March 15 of this year following the assassination of Prime Minister Razamara when the "nationalization" resolution was adopted. In anticipation of the confirmation of the agreement the company had made large advances to the government to meet current revenue needs. The company also has offered to join with the government in establishment of a company through which the latter would participate more directly in internal operations.

The activities of Anglo Iranian of course are by no means confined to Persia. Through its investment in other fields, its ownership of a great ocean fleet and its upbuilding of sales organizations in many important markets it has developed facilities which yield a good part of the income in which Persia now shares.

Persian ownership of its oil resources is clearly recognized in existing agreements. The company regards itself as a tenant holding a long-term lease on the strength of which it has invested hundreds of millions of pounds in exploration, in drilling and pipe line construction and in the creation of the world's largest refinery. Its operations supply the largest single contribution to state revenues and provide employment for 70,000 Persians under living conditions that conform to modern standards of comfort and convenience. The terms of its lease have been altered once to provide larger returns to the landlord and an agreement has been made to liberalize them again in the same direction. Such revisions by mutual consent are a normal procedure quite distinct from the present attempted cancellation which is prohibited by the government's own contract.

Leaving aside the question as to whether Persia has the means, the technical knowledge and the trained personnel to operate an oil industry it is obvious that to be cut off from the established market for its products would be a major catastrophe for the country, depriving it of its most important source of revenue and putting a great body of its workers out of employment.

In the broader international aspect of this situation experience has shown that oil is the key to success in war as it is a fundamental factor in all industrial progress and in the improvement of living conditions. The oil of Persia and of the whole Middle East is needed for the strengthening of the free world and its defense against aggression. Persia has associated herself with the other nations seeking to preserve their freedoms. She has everything to gain by maintaining this association and everything to lose by sacrificing it. As leaders in the movement for world betterment the United States and Great Britain should stand together in seeking to preserve the essential integrity of its all-important oil industry.

Nationalization In Persia

NATIONALIZATION of Anglo-Iranian Oil Co. properties in Persia by acts of both houses of the Iranian Parliament interrupts an arrangement between the British enterprise and the Iranian nation which has endured for half a century. Precise features of the contractual arrangement have been modified a number of times since the D'Arcy concession first was granted in 1901 and since 1909 when what is now known as Anglo-Iranian Oil Co. took over the year following oil discovery. What future arrangements can be worked out between the company and the nation are not yet clear as this is written.

In the 40 years since commercial production of oil was begun in the Masjid-i-Sulaiman field the company has produced 2.38 billion barrels of crude up to the end of 1950. Known reserves of recoverable oil in Persia have been estimated at seven to nine billion additional barrels in the principal fields thus far brought into production. Anglo-Iranian has carried on active geological and geophysical survey work seeking to block out other areas in its huge 100,000 square mile concession.

No suggestion has been made that Persian fields are not and have not been operated efficiently to produce maximum ultimate volumes of oil without physical waste at the surface or economic waste through failure to balance and maintain reservoir pressures. On the contrary, the Persian fields have been models which engineers throughout the world have studied.

The decision to nationalize the industry appears to have been entirely political in character. Impetus came from the National Front, a minority party in opposition to the government with only nine of the 136 deputies in the lower house. There is no reason to suppose that, lacking this militant political group, satisfactory renegotiation could not have been completed.

As world demand for petroleum products has increased the original concession terms have been modified from time to time in the light of world competition. While Anglo-Iranian negotiators had not proposed precisely the same terms as those reached in the Saudi Arabian renegotiations it was made known that the company would consider a similar agreement. It is stated that the most recent AIOC offer would have worked out to more than half of net profits being paid to the Iranian treasury. New terms proposed by Anglo-Iranian Oil Co. would have very largely increased the £16-million payable in 1950 under terms of the old agreement.

Original D'Arcy concession covering 500,000 square miles in Persia was renegotiated in 1933. At that time the area was restricted to 100,000 square miles and basis of payment was changed, from 16 percent of net profits to a tonnage basis. The concession was limited to a 60-year term from April 29, 1933.

Impetus for the most recent renegotiation of the concession was provided by the oil law adopted in October 1947. This law forbade the granting of additional concessions to foreigners and directed that surveys of possible oil areas be conducted over a five year term. The Iranian-Soviet oil company set up the previous year to develop northern Persia was disbanded but provision was made for negotiations with the Soviets for the sale of oil which might be produced in the north. Renegotiation with Anglo-Iranian made mandatory by the 1947 law was conducted in 1948 and 1949 culminating in a supplemental agreement signed in July of that year. Under terms of the supplemental agreement the tonnage royalty was to have been increased from four to six shillings per ton subject to adjustment for fluctuations in the price of gold. Annual tax payments were to have been increased to one shilling per ton. The 20 percent share in AIOC dividends paid under the 1933 agreement was extended to include also an immediate 20 percent share in sums placed in the general reserve before assessment of British income taxes. This share was previously to have been made on liquidation of the company. Immediate payment would be made of a 20 percent share of the reserve accumulated up to Dec. 31, 1947 and thereafter payment would be made each year. Anglo-Iranian undertook to guarantee that minimum payments under the 20 percent provision would not fall below £4 million per year. Persian oil prices were to be 25 percent below the U. S. Gulf under the agreement.

On the basis of the 1933 concession agreement AIOC paid the government £9.2 million in 1948 and £13.5 million in 1949. The proposed new agreement would have increased 1948 payments to £18.7 million and 1949 payments to £22.9 million. The old rate in most Middle East countries had been on the basis of about 20-22 cents (U.S.) per barrel. The proposed new agreement would have brought payments up about 50 percent to around 32 cents per barrel, roughly $2.40 per ton.

Additional sums proposed to be paid under the 1949 agreement were set aside by AIOC pending ratification of the agreement by the Iranian Majlis. In the short period before adjournment at the end of July, 1949, the Majlis failed to act. In June, 1950, the agreement was placed before the new Majlis which sent it to a commission of 18 deputies for study.

Chairman of the commission was Dr. Mohammed Mossadeq, vigorous leader of the National Front who has since been made premier. Five of the 18 commissioners were members of the National Front. As previously mentioned only nine of the 136 deputies in the entire Majlis are members of this minority party which has been steadfastly in opposition to the government.

While the commission was busy with its studies there was agitation in the Persian press in favor of nationalization of the oil industry. In late November the commission unanimously recommended that the proposed agreement be rejected as failing to safeguard national rights. It was suggested that the government reopen negotiations to obtain better terms.

About this time the government withdrew its proposed oil bill with the result that the deputies were angered and the Minister of Finance was forced to resign. The Majlis deputies thereupon instructed the commission headed by Dr. Mossadeq to formulate a new national oil policy.

During the late months of 1950 and the early months of this year prior to the recent parliamentary action there was a great deal of public discussion. Mass meetings were organized in various parts of the country. Some of these were sponsored by the "Organization for the Struggle Against the AIOC" which had been formed somewhat earlier. It is reported that the Organization has been affiliated with elements in the outlawed Tudeh party which has followed the communist party line.

Attacks on all who have supported the government in recent months have been vitriolic. Name calling including such terms as "traitor" has been frequent. When the strike was

called against the company by refinery workers at Abadan those who wanted to work were threatened with bodily injuries and nine Iranians, as well as three foreigners, were killed and others injured. Until recently the labor situation has been calm and doubtless would have remained so except for the activities of agitators. Anglo-Iranian has paid high wages and provided other benefits to the point where it has traditionally had no labor problem. Applicants for work have exceeded the supply of jobs.

Nationalization of the oil industry in Persia will pose many problems of financing and control. Obligation of the nation under international procedures is that the expropriated properties be paid for on a reasonable basis. The nation does not have a great capital surplus available for such payment. As a matter of fact Anglo-Iranian has been asked many times in recent years to make advance payments to the government. In the spring of 1950 AIOC agreed to advances totaling £14 million to tide the government over when the treasury was not too well filled.

Anglo-Iranian properties in Persia have a tremendous physical value. In addition to the producing field equipment there are 1,718 miles of main pipelines to transport oil to the port of Mashur and to the world's largest refinery at Abadan. This great refinery processed 23,245,000 tons of crude oil in 1949, an average of nearly 524,000 barrels daily. The plant is equipped with modern catalytic cracking facilities and equipment for the production of aviation gasoline and lubricating oils.

No bar has been set up to prevent AIOC being retained as operator of the properties for the government as will be the case in Colombia later this year when the De Mares concession in that country reverts to the nation at the agreed expiration date. The militant Dr. Mossadeq has sponsored the following proposal:

"1. The Majlis hereby declares that the oil industry is nationalized throughout Iran in the sense that all oil mines will be operated to the account (and benefit) of the Iranian nation.

"2. As from the date of approval of this law and the settlement of the accounts of the southern oil mines, the AIOC will operate the fields as an agent of the government under a Board of Control.

"3. The Board of Control mentioned in article 2 above will consist of 8 Majlis deputies and 8 senators as elected by each house. (This has since been modified to consist of five senators, five deputies, the finance minister and one man to be appointed by the government.)

Table I—Direct Payments by AIOC to Iran (1933-1950)

Year	Pounds Sterling
1933	1,785,013
1934	2,159,143
1935	2,191,952
1936	2,828,502
1937	3,444,439
1938	3,307,478
1939-1943	20,270,814
1944	4,463,779
1945	5,623,161
1946	7,130,258
1947	7,104,022
1948	9,172,244
1949	13,489,271
1950 (estimated)	15,954,000
Total	98,924,076

Automatic flow-limit valve on high pressure production line in the Agha Jari field. Note pressure gauge reading is 1,600 psi.

"4. The Board of Control is required to negotiate with the AIOC regarding settlement of accounts and report the results to the Majlis for approval within eight months at the latest.

"5. In the event that the AIOC refuses to abide by the decision stated under article 2 above, the Board of Control is required to set up a committee of seven from among its members or from outside to act as a provisional Board of Directors.

"The Board of Directors will study the question and after consulting competent technicians submit its proposal to the Majlis and the Senate regarding the formation of a permanent organization to operate the southern oil fields."

Assuming that adequate funds could be obtained in world markets to pay for the oil properties and that AIOC declines to become operator as suggested, it is not thought likely that Iranians have the necessary technical skills to operate the properties as a public enterprise. It is reported that smaller state operations of a commercial nature in Persia have not been notably successful.

The Iranian nation has a tremendous stake in the successful exploitation of its oil reserves as may be judged by the employment opportunities it has offered to its nationals and the direct payments made to the government as taxes and royalties under the 1933 concession. Total payments in the past seventeen years have aggregated £98,924,076 according to a tabulation prepared in October, 1950, by Dr. John Murray for the Iranian government. Payments have been about half of total government revenues. Details are given in Table 1.

The supplemental payments for the years 1948-50 proposed under the 1949 agreement as rejected would have increased the amount named above by £34.4 million.

Foreign exchange position of Persia has been improved by the large annual conversions of sterling to rials. This is true because the government has made a profit on its sale of sterling amounting to about £7 million per annum. The government owns a stock interest in AIOC which has been yielding 7.5 million rials in annual dividends. It has collected 95 million rials in personal income taxes from AIOC personnel and 125 million rials in import duties. Estimated total income for 1950 on the basis of the 1933 concession was about 2,232 million rials, roughly £25 million.

Asmari Mountain, typical of the rugged terrain in the oil regions of southern Persia.

Anglo-Iranian is the only company operating in Persia as a producer although the government Iran Oil Co. has been set up to exploit possible oil resources outside the AIOC concession area. Iran Oil Co. was organized in 1949 with a proposed capital of one billion rials ($31 million, £7.8 million at official rates of exchange). Thus far only 84 million rials have been paid in but an additional 145 million rials will be allotted for company expenses in the next biennium.

Fatollah Naficy is managing director of Iran Oil Co., Bagher Mostofi is in charge of technical operation. Dr. Kaihan is operations director. Arnold Heim, Swiss geologist, is advisor to the company in charge of the extensive geological survey work now in progress.

Geological work was centered in the vicinity of Tehran in 1950. Decision to study Qum and Dast-e-Kavir as possible sources of oil was taken because of its nearness to the heaviest consuming area in the nation. Petroleum products mostly are brought in from Abadan in the south but the railroad is heavily burdened with traffic so that a nearby source of supply is considered highly desirable.

The Iranian government ran afoul of Soviet Russia early in 1950 as a result of its oil reconnaisance work in the northern part of the country. The Soviets protested against aerial mapping near the border because foreigners were doing the work. Although Iran rejected Soviet allegations at the time it was agreed that nearby mapping would be done from the ground rather than by the faster and more economical aerial method.

This year's survey work will include core drilling of surface prospects in the Qum region. Equipment for this purpose is being imported from the United States.

Thus far the Iran Oil Co. appears to have complete public support. Whether radical elements which have opposed the government as a matter of policy will continue this support during the exploration work is a matter of conjecture only. Normally the development of production is a long, costly job in strictly wild cat territory particularly where the terrain is difficult as it is in Persia.

Table II—AIOC Exports from Persia

(Thousands of Metric Tons)

Year	1326 (1947-48)	1327 (1948-49)	1328 (1949-50)
Kerosine	5,577	10,093	11,583
Gasoline	2,957	3,003	3,410
Fuel Oil	4,926	1,240	2,554
Crude Oil	4,302	5,729	3,960
Other Products	152	120	—
Total	17,914	20,185	21,507

Table III
AIOC Exports from Persia by Principal Countries

(in millions of rials)

Countries	Year 1326 (1947-48)	1327 (1948-49)	1328 (1949-50)
Kerosine			
United Kingdom	1,832	3,967	2,905
India	314	991	869
United States	67	534	677
Saudi Arabia	—	281	683
Others	662	558	2,475
Total	2,875	6,331	7,609
Gasoline			
United Kingdom	1,763	1,361	1,120
India	210	566	631
Union of South Africa	—	140	497
Australia	102	213	166
Egypt	12	58	136
Others	313	1,471	1,406
Total	2,400	3,806	3,956
Fuel Oil			
United Kingdom	1,950	435	530
Saudi Arabia	—	10	166
Egypt	7	25	138
Norway	9	36	94
India	81	676	63
Others	395	419	459
Total	2,442	1,601	1,450
Crude Oil			
United Kingdom	1,565	1,333	890
Argentine	—	75	813
France	—	—	256
Italy	167	290	67
Belgium	12	36	48
United States	26	396	9
Saudi Arabia	62	566	18
Others	342	1,215	299
Total	2,174	3,911	2,373
Other Products			
United Kingdom	88	56	—
Iraq	7	14	1
Others	6	21	1
Total	101	91	2

Domestic demand for petroleum products is very largely supplied by Anglo-Iranian Oil Co. from the Abadan refinery although some products are supplied locally from the smaller plant at Kermanshah. This latter is a skimming plant with a capacity of about 2,000 barrels of crude per day.

AIOC has been expanding its storage facilities throughout the country in order to provide ample supplies at all times. This has been done because winter weather often blocks roads to areas which must be supplied by road transport and because the railroad facilities are so overburdened that delays in tank car movement are inevitable at times. A storage depot has been built at Qum to aid in rapid turnaround of tank cars. At Teheran the storage has been built up to about 1.5 million gallons capacity. For road transport tank trucks are used as well as for the more conventional 18-liter tinned deliveries.

Domestic consumption of principal petroleum products in the Iranian year 1327 (ended March 20, 1949) totaled 227,400,000 U.S. gallons as follows:

Gasoline	47,057,000 gallons
Kerosine	53,907,000 gallons
Gas Oil	15,216,000 gallons
Fuel Oil	111,218,000 gallons

Only a limited volume of specialty products now is being imported. In the Iranian year 1328 (ended March 20, 1950) total national imports of petroleum products were valued at only $910,000 at official exchange rates. Principal supplying nations for the special products were the United States and the United Kingdom. Contrasted with this, exports recently have been running at the rate of 18.4 billion rials per year ($575 million). The total for the year 1328 was 15.39 billion rials ($480 million). The volume of exports during the latest three years for which data is available is shown in Table II. Destination of exports is shown in Table III.

The Persian oil fields are some of the most remarkable in the world due to the porosity and the great thickness of the producing section. With high formation pressures and a water drive the fields might well have been damaged greatly by careless or ignorant exploitation. Fortunately for the Iranian nation AIOC has been a prudent operator staffed by engineers with inquiring minds. Result is that methods employed in Persia have been in advance of those in many other parts of the world.

There are seven producing fields in Persia all except one of which are located in the southern part of the country within a radius of 165 miles of the refinery at Abadan. Exception is the Naft-i-Shah field discovered in 1923 near Kermanshah and operated by Kermanshah Petroleum Co. Ltd., an AIOC subsidiary. This is a two-well field supplying the local refinery and does not have an outlet to world markets. Remaining fields are: Masijid-i-Sulaiman (MIS) discovered in 1908, Haft Kel discovered in 1927, Gach Saran discovered in 1928, Naft Safid discovered in 1934, Agha Jari discovered in 1937 and Lali discovered in 1938.

Most important of the fields are MIS, Haft Kel, Agha Jari and Gach Saran although the Lali field now is believed to have large reserves.

All of the fields produce from the Asmari limestone series of Lower Miocene to Oligocene age. All structures are large anticlines in which the oil is trapped by salt water. The limestone has been severely folded with the result that it is fissured extensively. It is from these fissures that oil is produced most readily. The Asmari series ranges in thickness up to 1,500 feet and pressures within the reservoirs range as high as 4,500 psi. Porosity ranges from two to 15 percent, the average being perhaps five percent.

Great care must be used in drilling operations in such high pressure areas to avoid disaster. Special drilling muds must be used because of the salts encountered, and, of course, modern equipment is a necessity.

MIS, the oldest field in Persia has produced nearly a billion barrels of crude in the past 40 years and still is turning out nearly 60,000 barrels daily. Only three other fields in the world have produced more oil. In 1936 the production of MIS was exceeded by Haft Kel which is of equal dimensions or perhaps greater than MIS. Following the recent completion of a 20-22-inch pipe line from Agha Jari to the port of Bandar Mashur this latter field has become the largest producer of crude in Persia. Agha Jari output during the past year has been roughly half of the Iranian production. Of the 165,000 acres

of proved producing area in Iran about 100,000 acres are included in the three fields just mentioned. Gach Saran with 40,000 acres proved and an average producing zone thickness of 1,500 feet is one of the great crude reserves of the world.

Astonishing to most oil men is the small number of wells which have been found necessary in Iranian fields. At the end of 1947, H. S. Gibson, general field manager for AIOC reported that only 229 wells had been drilled in the 35,000-acre Masjid-i-Sulaiman field and that at no time have more than 31 wells been used for production at any one time. About 80 wells were active in all of Persia in 1950 to produce 675,000 barrels of oil per day. Throughout the life of the various fields AIOC engineers have kept most careful records of well performances, water levels and reservoir pressures at various rates of production. By means of such records and through continuous experimentation, means have been found to balance production so that the oil-water contact level will be uniform in all parts of the fields. In MIS it was found that the effect of varying rates of production in one well might be observed in wells as far as three miles away. Some wells, on the other hand, seemed to be so nearly compartmentalized that results of their production were reflected only very slowly in neighboring boreholes.

Rates of production for entire fields have been studied as well as those for individual wells. At Haft Kel it was found that an annual production rate of 17 million barrels was far more efficient than a rate of around 30 million barrels. At the slower producing rate it was calculated that an additional 50 million barrels of oil could be produced with the same reservoir pressure drop. It is such detailed and painstaking studies on the part of the company which have conserved the natural resources of the Iranian nation during periods when the urge has been strong to get the oil out quickly at any cost. Instead of unduly expanding production the company has continuously expanded the number of observation wells drilled for the sole purpose of controlling output to MER.

Recent production of oil in Persia has been averaging a little under 700,000 barrels daily. In the final quarter of 1950 the average was 678,000 barrels daily and in the first quarter of this year 684,000 barrels. This is about 35 percent of the production of Middle Eastern fields. Production of the area has been about as follows:

Thousands of Barrels Daily

Nation	First Quarter 1951	Fourth Quarter 1950	Year 1950
Iran	684	678	666
Saudi Arabia	611	641	547
Kuwait	386	396	345
Iraq	166	163	136
Qatar	46	41	34
Egypt	46	46	45
Bahrein	30	30	30
Turkey	1	1	1
	1,970	1,996	1,804

The 1949 annual report of Anglo-Iranian showed current assets of £110,033,192 and other assets with a depreciated value of £97,799,818. The company's investment in lands, wells, pipelines, refineries and tankage was stated at £37,870,816 after reserves for depreciation. The report does not, of course, suggest what portion of the company's fixed assets are located in Persia and hence affected by the nationalization. Obviously the proportion would be quite high. In 1949 the company produced 33,937,000 tons of crude oil of which 26,807,000 tons or 79 percent came from Persia. Of its total refinery throughput of 27,982,000 tons in 1949 the Abadan plant processed 23,245,000 tons.

Policy of the company has been to plow a large part of earnings back into the business for more efficient operation and to care for the growing demands of its customers. In 1949 the company reinvested £55,750,000 of which £8.5 million went into tankers.

Development of the Abadan refinery has required very large sums. An important part of the recent investment is in a fluid catalytic cracking unit designed to improve the balance of black and white products of the plant.

The throughput of Abadan refinery, the largest in the world, is around 540,000 barrels of crude oil per day and out of this roughly 25,000 barrels of wax distillate will be used for the new catalytic cracker. The unit itself is designed to operate on 25,000 barrels per day input at 55 percent conversion up to 29,000 barrels per day at 45 percent conversion rate. Although it has not yet been pushed to anything like its full capacity, it is expected that eventually the input may be increased to approximately 35,000 barrels per day.

Apart from light and heavy gas oils and clarified oil, this new cracker will produce something like 10,000 barrels per day of motor gasoline, and there will be a butane/butene product for use in the alkylation process and gasoline cuts available either for aviation or motor spirit.

This new fluid unit was designed by the Foster Wheeler Corp. and its gas recovery plant by E. B. Badger & Sons Co. Overall supervision of construction was in the hands of Foster Wheeler who had a site force of something like 25 American engineers. Assisting them in the job of directing the work of some 900 Iranian craftsmen were a number of Anglo-Iranian staff, engineers from Badger and other specialists, including roughly 30 specialized pipe fitters and riggers from the British firm Matthew Hall & Co.

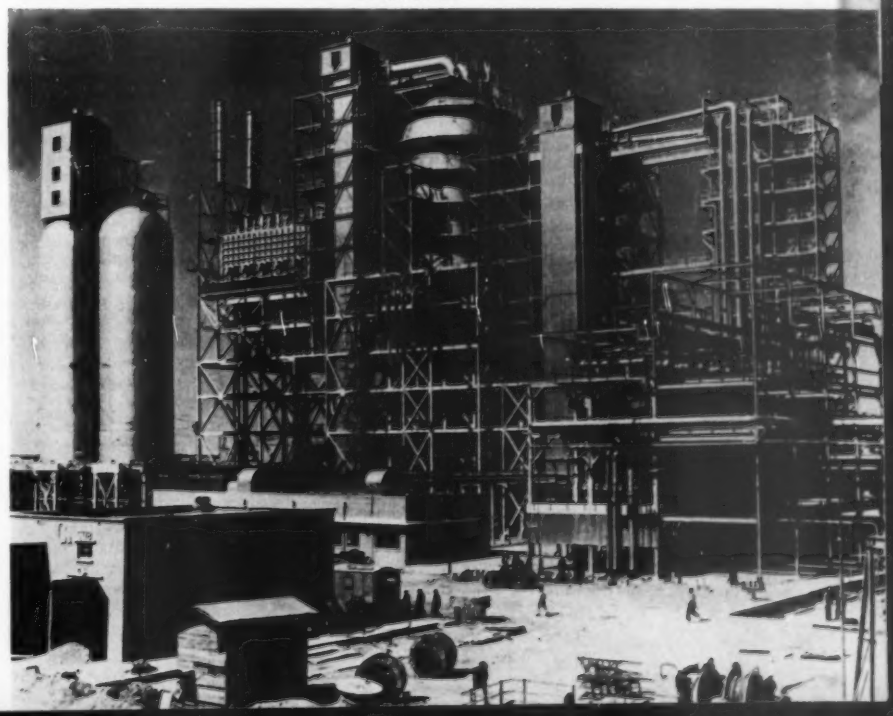
Into the two plants and two additional boilers and link-up lines went 15,100 tons of steel and 1,900 tons of cement. The cracking plant covers an area of 235 feet by 275 feet and is 175 feet in height, having 13 floors, which are served by two elevators. Fifteen miles of piping, 10,000 feet of which are of stainless steel and 1,000 feet of eight-inch chrome steel, were used. The regenerator measures 47 feet in diameter and is one of the world's largest. One of the catalyst carrying lines is nearly eight feet in diameter.

The two catalyst storage hoppers have a capacity of 1,680 tons, and one is designed to take a temperature variation from atmosphere to 1,000°F in a few minutes. This would come into use to take the catalyst should it be necessary to shut down the plant in an emergency.

The gas recovery plant has a capacity of 21,000,000 cubic feet per stream day and eight compressors with a total horsepower of 3,000.

Recent curtailment of the Abadan refinery activities has had a profound effect on the flow of world trade. The great refinery with about five percent of the world's capacity is an important segment of the industry which cannot be shut down for any length of time without unduly effecting international commerce. From the standpoint of the non-communist world it is essential that differences between Anglo-Iranian Oil Co. and the Iranian Government be settled with all possible speed. From the standpoint of the government itself settlement is highly desirable so that state revenues are not adversely affected. The recent strike caused the loss of some 10,000,000 barrels of oil products to world markets at a time when this quantity could be ill spared.

New 25,000-barrel catalytic cracking unit which went on stream recently at the Anglo-Iranian refinery at Abadan.



P. C. Spencer, president, Sinclair Oil Corp.

W. M. Flowers, executive vice-president, Sinclair Research Laboratories, Inc.

E. W. Isom, chairman, Sinclair Research Laboratories.

Sinclair Research Laboratories Invite Ideas for Development

UNDER "The Sinclair Plan" as recently announced by P. C. Spencer, president of Sinclair Oil Corp., facilities of Sinclair Research Laboratories at Harvey, Ill., will be made available to aid outside inventors. Invitation will be extended to any American with an idea for a new or better product or application to submit it to Sinclair for research and development

The plan contemplates that Sinclair will use part of its modern new research plant to develop ideas of inventors outside the Sinclair organization without cost to the inventor. In return Sinclair will receive shop rights but income from all outside sales of the product or process will be retained by the inventor. As protection for both company and inventor it is required that any idea accepted must first be covered by a patent or patent application.

In announcing the new plan Mr. Spencer pointed out that inventors of earlier years were able to develop their ideas in home workshops. "Henry Ford did it that way. So did Edison, the Wright brothers and hundreds of others," Mr. Spencer said.

"Today, however, the man with an idea often needs years of time, the help of an army of specialists, and thousands, even millions of dollars' worth of equipment to prove out his invention. This plan provides all the necessary technical facilities and skilled personnel to any American with an accepted idea, to bring that idea from the roughest scratch-pad stage through to final pilot-plant testing."

Under the Sinclair plan ideas submitted by outside inventors will be studied first by a screening committee to be set up by the laboratories. Once an idea is accepted for development an agreement with the inventor will be signed and research undertaken.

Sinclair Research Laboratories Inc. recently was incorporated as a subsidiary of Sinclair Oil Corp. All research assets of the parent company are owned and operated by the new corporation. Principal asset is the 38-acre plant at Harvey, Ill., recently completed at a cost of more than $6 million.

The Harvey laboratories consist of nine major buildings with 200,000 square feet of floor space housing a staff of 550. Operating cost of the plant is on the order of $5 million yearly. The laboratories were designed to permit some expansion within the present buildings as well as by the erection of additional units. It is anticipated that the present plant will be adequate to house new research required by submission of outside ideas at least for the present.

The administration building at Harvey houses a library of some 12,000 volumes. To it flow some 200 periodicals each month, new books and about 2,500 patents per year for abstracting. Offices and conference rooms are provided for management and assistants.

The main laboratory building is a three-story structure with a floor area of 55,000 square feet containing 65 laboratories, 13 offices and a conference room. Half of the third floor is occupied by catalysis research personnel. This is a subject in which Sinclair technologists have made notable contributions to the knowledge of the refining industry.

At the annual meeting of the American Chemical Society a year ago the Ipatieff award for outstanding experimental work in the field of catalysis was presented to Dr. Herman E. Ries, Jr., head of the physical chemistry department of the Sinclair laboratories. Dr. Ries has contributed to the understanding of how catalysts work. He has investigated the area, structure and surface composition of catalysts to shed light on the correlation of physical characteristics with their performance.

In addition to the third floor space devoted to catalyst work one wing of the first floor now is devoted to catalyst preparation and studies concerned with the flow of catalysts through pipes and vessels of various sizes and proportions. The preparation section manufactures catalysts required for both the small scale experiments and the pilot plant runs. Pelleting and grinding equipment is available to create desired physical forms. Small scale runs are conducted in this building and promising ideas tried out later in the exploratory research building and finally in the pilot plants.

The exploratory research building is devoted to bench scale testing. It is a step half-way between the research chemist's work and the pilot plant. A large part of the current work here is in catalyst evaluation. The studies include aging reactors to find out how a given catalyst will stand up in service.

In the pilot plant building Sinclair researchers now are studying catalytic reforming as well as cracking of middle distillates. This particular building is divided into six main bays each of which is 54 feet high permitting the installation of fractionating and other equipment of adequate height to carry on pilot operations of significant proportions. In the bay currently devoted to catalytic reforming a unit is charging up to 10 gallons per hour to reaction chambers containing about 40 pounds of catalyst. With the catalyst now being used a 35 octane naphtha is being upgraded to 80 octane with a 90 percent recovery.

An important part of the Sinclair laboratories is the engine building in which lubricants and fuels are given performance tests in single and multi-cylinder engines. This 119 by 208-foot building is equipped with insulated, sound-proof engine cells. Indicating and recording instruments are located outside the cells. All engines are mounted on isolated floor slabs in vibration damping mounts. Road tests are carried out concurrently with block tests.

One building is devoted to lube and grease testing and another to fuel oil studies. In this latter building furnace oils are burned in various types of equipment for service evaluation.

Recently elected officers of the laboratories are E. W. Isom, chairman; Mr. Spencer, president; W. M. Flowers, executive vice president, and E. C. Herthel, vice president. Directors include Mr. Isom, Mr. Spencer, Mr. Flowers, Mr. Herthel and W. R. Argyle, E. L. Hughes, T. B. Kimball, W. H. Morris and H. L. Phillips.

Means of Replacing Iranian Oil Studied by Defense Agency

By Joseph Huttlinger

WASHINGTON

THE United States is completing plans today to help supply petroleum products to Europe and the free world in the event of oil shortages springing from the Iranian oil nationalization drive or other factors.

A curtain raiser in the effort, an effort just coming to a conclusion, came April 25, when representatives of 19 American oil companies, all those operating abroad, met in Washington at the request of the Petroleum Administration for Defense.

The Iranian turmoil, which then had lowered the output of Iran's huge Abadan refinery from a capacity of 550,000 barrels daily to 100,000, posed a serious threat to world oil supply, said the PAD, adding:

"The situation requires immediate consideration by responsible government agencies and United States oil companies operating abroad of actions which can be taken to maintain adequate supply and distribution of petroleum products on a worldwide basis."

Accordingly, a 12-man committee was formed to draft a plan whereby American companies could cooperate with each other, in the event of shortages, to help meet them. The plan, includes arrangements for pooling of transport facilities to eliminate back hauls and the like; adjustment of refinery operations and yields to achieve maximum output of certain products; pooling and joint use of overseas storage facilities; and exchange of products to bring savings in transportation, distribution and other areas.

Activities of this nature, normally violate the U. S. antitrust laws; but they can be conducted under the Defense Production Act, to meet emergencies, provided the Department of Justice gives prior approval, and provided the Federal Trade Commission has a chance to comment on the plan before it goes into effect. Completion of the PAD work, thus, sends the plan to these agencies.

The plan is the second such voluntary agreement in the industry to cope with emergency situations. The other was a tanker pool, created at the behest of PAD and the Maritime Commission.

Members of the 12-man world supply committee included: C. S. Snodgrass, assistant deputy administrator of the PAD in charge of foreign oil operations; Justin Wolf, general counsel of the PAD; J. Terry Duce, and John Noble, Arabian-American Oil Co.; H. H. Lipp and H. Kiernan, California-Texas Oil Co.; E. F. Perkins and Grover Ross, Gulf Oil Corp.; R. C. Jopling, Phillips Petroleum Co.; John Scott, Socony-Vacuum Oil Co.; George Keogler, Standard Oil Co. (N.J.); A. N. Lilley, The Texas Co.

Should the Iranian situation clear up, PAD still would seek the voluntary world supply agreement as a standby device, for use should other factors upset supply.

Any major interruption of supply from Iran, at this time when oil consumption and supply are running hand in hand, could have serious consequences over the world. The prospect of rationing not only in Britain, but in the United States has been discussed, although there is a belief that a settlement to continue Iranian oil production will result.

At Washington, the Russian influence in the current trouble is regarded as one of glee at the turmoil, rather than active desire to take over the Iranian oil fields. In the long run, however, the prospect is seen that the Russians might have better success in obtaining Iranian oil if it is in government hands, than in British.

Within the government, many Iranian leaders have expressed concern about running their own oil industry. They have wondered if materials would be forthcoming from the United States, Britain and other European countries; if countries would buy their products; if they had the technical skill to operate drilling rigs and refineries on their own; if they would be able to obtain skilled foreign workers in the numbers needed. And responses have gone so far as to suggest drastic solutions. For instance, one proposal has been to offer to sell oil at substantially below world prices, if needed, to obtain markets. Another has been to engage in barter, offering oil for steel and other materials. Another argument has been, that if the Iranian oil industry operates at but a fraction of capacity, they would see as much revenue, running it itself, as if the British company owned the property. At the same time, oil would be saved for future generations. Payments to AIOC for Iranian properties of from £100 to £200 million have been suggested as proper by Iranian leaders.

American officials held private talks with British Ambassador Oliver Franks and high officials from London about the Iranian situation from April 9 until April 19. For this, they were accused by the Iranians of plotting against that country. But for failure to speak up for the British, the State Department was criticized by Britain. The talks broke up with a press release stating that "The conversations were satisfactory to both governments and comprised an informal exchange of views on matters pertaining to their broad policies in the area whose general objectives are similar. Among other matters, the Iranian oil question was discussed in general terms only, since it was fully recognized that the problem must be worked out elsewhere by the parties directly concerned."

A target of 2,400 new oil wells in areas outside the United States this year has been agreed upon by the Petroleum Administration for Defense and four other agencies which have their hand in foreign petroleum operations. The target was prepared in order to estimate needs for steel exports from the United States.

Authorization to place delivery orders for oil-country tubular goods—casing, tubing and drill pipe—for shipment from U. S. mills during July have been issued by the National Production Authority to 41 petroleum operators for use in drilling oil and gas wells in 20 foreign countries, it has been announced.

None of the authorizations are for Iranian operations, but they cover most Middle East countries, Tunisia, Indonesia, New Guinea and Borneo, Holland and Denmark, India and Pakistan, and Latin American countries.

Foreign operations of American oil companies are finding troubles operating under too many cooks. At present, five government agencies have their hand in the picture, although the companies prefer PAD to take complete control. According to the directives, the Commerce Department and Economic Cooperation Administration have chief authority. In practice, they consult with the PAD. In addition, Defense and State Departments put in their word. This brought the ridiculous situation of a conference of the five agencies before a press release could be put out pertaining to a routine action in the field of foreign petroleum. During the last war, the Petroleum Administration for War, was the prime authority.

Although American oil producers no longer complain of excessive oil imports, their two-year-old drive to limit oil imports is just now bearing fruit. In fact, the relief being obtained in legislation completing its course through Congress, goes so far as to permit either oil or "directly competitive" industries (such as coal) to object to imports of foreign oil before the Tariff Commission. The amendment providing this is attached to a measure extending the Reciprocal Trade Agreements Act, authority for tariff-cutting actions, and at the moment carries the approval of the full House and of the Senate Finance Committee. The action goes so far that one producing group, Texas Independent Producers and Royalty Owners Association, has resolved against certain features of it, and the Independent Producers Association of America has been forced to explain that it had to ally with coal to obtain any relief. Jobber segments of the industry have threatened a bitter battle if producers seek to invoke relief clauses, once action has been completed by Congress.

A standpat on the 27.5 percent depletion allowance for oil and gas producers has been voted by the House Ways and Means Committee, which thus ended for the duration of the emergency the Treasury Department's efforts to roll back the allowance to 15 percent. The committee also voted to increase gasoline excise taxes to two cents a gallon, despite a Treasury request for a doubling of the tax.

A sharp battle is on between Defense Mobilizer Charles E. Wilson and PAD chief Bruce K. Brown over pipe line, in particular, and other materials in general for oil and gas industries. Wilson has asked oil men to exercise "restraint" and go in for "scheduling" in their requests for scarce materials, but Brown says the oil men need every pound of steel they are asking for, or there will be shortages.

Oil Profits Rise 23 Percent

Earnings from large increases in 1950 oil demand permit petroleum industry to meet capital requirements for expansion to meet defense needs and pay greater dividends to shareholders.

By Henry E. Rose

AN unprecedented demand for oil products both in this country and from abroad enabled the leading American oil companies to increase their earnings by 23 percent in 1950 as compared to 1949. Last year was the industry's second best in earnings.

The rising trend of 1950 was in contrast to the decline in 1949 when earnings of leading companies showed a decrease of 9.7 percent as compared to 1948, the record for oil industry earnings. Influencing the higher consumption of oil products last year were the acceleration in industrial activity and an increase in demand for products from the military following the Korean situation in June of that year. More normal winter weather also had its effect on demand for products.

The accelerated demand for products which developed in the last half of 1950, moreover, has continued thus far in 1951, with indications that the full year will result in a high level of earnings to be tempered only by increased taxes and higher costs of operation.

Crude oil production and refinery operations currently are at levels averaging more than 1,000,000 barrels a day higher than in the same period of 1950 when the total demand for products increased by 11 percent. To meet the higher demand the industry has been forced to increase not only its domestic output of crude oil but, also, to step up its imports of both crude oil and refined products from foreign sources.

The heavy demand for products, of necessity, will mean increased capital expenditures by the oil industry this year both in exploratory operations in the search for new oil reserves and in the expansion of its manufacturing capacity. The heads of several large companies commented on this need in recent reports to their stockholders.

B. Brewster Jennings, president of Socony-Vacuum Oil Co., Inc., as an example, said that his company's capital expenditures "as planned for 1951 approximate $200,000,000, about one-third more than we spent in 1950, and some of these project expenditures may have to be curtailed or delayed because of shortages of critical materials." Socony's capital outlays in 1950 totaled $145,400,000 compared to $151,400,000 in 1949.

As to the sale of oil products in foreign lands, in which Socony has a sizable interest, Mr. Brewster said that these "are increasing rapidly due in part to relaxation of rationing but principally to the higher tempo of industrial activity." He said that part of the present high demand represents consumer stock-piling, with both the demand for crude oil and products increasing above 1950.

Robert H. Colley, president of Atlantic Refining Co., said that his company's capital

Table 1

First Quarter Earnings of 31 Companies, 1951 Compared with 1950

	1951 Net income	Per Share On Common	1950 Net Income	Per Share On Common		1951 Net income	Per Share On Common	1950 Net Income	Per Share On Common
Amerada	$3,841,837	$2.64	$3,283,335	$2.08	Socony-Vacuum	37,000,000	1.16	22,000,000	.69
Anderson-Prichard	1,250,243	1.54	741,930	.91	Standard, Cal.	38,401,948	1.34	24,924,457	1.74
Atlantic Rfg.	11,590,719	3.14	8,710,970	3.09	Standard, Ind.	33,749,000	2.21	24,700,000	1.61
Cities Service	20,017,152	5.15	16,271,757	4.40	Standard, Ky.	2,632,000	1.01	3,152,000	1.21
Continental	11,070,544	2.28	8,139,303	1.69	Standard, N. J.	118,000,000	3.90	65,000,000	2.15
Deep Rock	631,000	1.58	795,000	1.99	Standard, Ohio	4,702,551	1.23	2,722,733	.71
Gulf	31,972,000	2.82	25,957,000	2.29	Sunray	6,056,824	.62	2,961,000	.49
Houston	1,915,366	1.74	1,596,080	1.45	Texas	40,537,711	2.95	23,960,183	1.74
Lion	3,082,729	1.32	3,709,526	1.58	Texas, Gulf	822,049	.74	729,276	.67
Mid-Continent	4,398,427	2.37	2,529,023	1.36	Tex. Pac. C. & O.	1,638,547	.92	1,315,381	.74
Ohio Oil	9,015,064	1.37	8,360,862	1.27	Tide Water	8,910,483	1.39	6,152,301	.94
Phillips	15,882,271	2.51	10,049,580	1.66	Union	6,645,138	1.22	1,844,178	.31
Plymouth	2,494,984	2.06	1,391,502	1.16	Universal, Consol.	686,472	2.46	435,386	1.56
Richfield	6,938,987	1.73	3,571,439	.89	Wilcox	232,343	.82	158,312	.56
Shell	23,258,557	1.73	22,060,639	1.64					
Sinclair	18,396,906	1.52	13,326,502	1.11	TOTAL	$473,032,832		$316,232,363	
Skelly	7,260,980	2.77	5,682,708	4.35	Increase	49.5%			

expenditures in 1951 are placed at $70,000,000 against $40,000,000 in 1950 because of the increased demand both of the armed forces and by the civilian economy. "The demand for petroleum products will continue to increase this year and sales will set another record," he commented, "since the prospective growth of steel, chemicals and other industries in our chief consuming area will mean new requirements for products."

This record demand for petroleum products is evidenced by the increasing number of petroleum consuming products coming into use. Motor vehicles in the United States showed an increase in registrations of approximately nine percent in 1950, while increases of eight percent to 14 percent were shown for oil burners, diesel locomotives and farm tractors.

In spite of the increasing demand for products, necessitating continued higher capital expenditures, the industry, generally, has been financing its improvements and expansion from its own earnings and without recourse to the capital markets for new funds. This is evidenced by the fact that leading companies operating in the United States actually showed a net reduction of more than $100,000,000 in their aggregate funded debts in 1950 as compared to the previous year.

For thirty leading companies (five have been added for 1950) used by WORLD PETROLEUM in its annual review of financial operations, profits amounted to $1,873,434,165 in 1950, an increase of 23 percent as compared to the $1,522,333,230 earned in 1949, and with $2,075,564,000 earned in 1948, the record year.

Last year's earnings were equal, after allowance for dividend's paid on preferred stocks outstanding by a few companies, to $7.42 a share on the 251,188,514 shares of common stock outstanding at the end of 1950. The latter compared with $6.62 a share earned on the 230,045,159 common shares outstanding at the end of 1949. A large part of the increase in common shares in 1950 stems from the split-up of those shares by several companies.

Increases were shown by 28 of the 30 companies during 1950 and only two, Union Oil Co. and Texas Gulf Producing Co., recorded decreases.

The largest increases were reported by Standard Oil Co. (N.J.), Atlantic Refining Co. and Lion Oil Co., each of whom showed gains of more than 50 percent in earnings as compared to 1949. The net income of Standard (N.J.) totaled $408,223,223, equal to $13.48 a share of outstanding common stock against $268,869,501 in 1949, equal to $8.91 a share of common stock.

Seven of the country's oil companies were in the "$100,000,000 earnings class" in 1950. As a group their income amounted to $1,200,653,827, equal to 60 percent of the total reported for the 30 companies. Besides Standard (N.J.), they were Standard of California, Texas, Humble, Socony-Vacuum, Standard of Indiana and Gulf.

Although the industry, as represented by these 30 companies, paid out more in total cash dividends on common stock than in 1949, the ratio of such dividends to earnings held at about the same percentage in each year. For 1950 the ratio of dividends paid on common stock was 40 percent against 41 percent in 1949. Actual cash dividends on common stock paid by 29 of the 30 companies in 1950 (Pacific Western Oil Co. did not pay a dividend in that year but said that it would give consideration to the resumption of payments in the near future) totaled $733,499,215 compared with $624,490,117 paid on common stock by 30 companies in 1949.

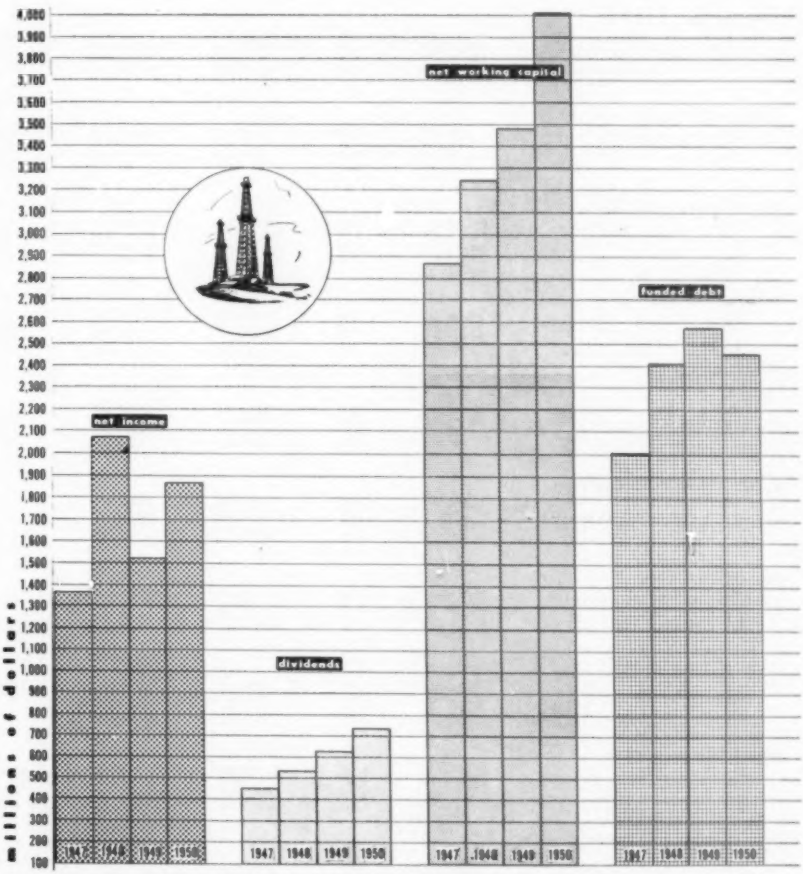
All but six of the companies (excluding Pacific Western which paid none in 1950) distributed larger amounts of cash than in 1949. The largest cash payment was by Standard (N.J.) of $151,027,988, equal to $5 a share of capital stock outstanding. It compared with $119,755,901, or $4 a share, paid in 1949. Other sizable increases in cash distributions were made by Standard of California last year; $71,620,489 compared with $54,579,661 in 1949; Standard of Indiana which distributed $41,206,971 against $30,569,564 and Texas Co. which paid out $75,795,357 against $55,142,428 in 1949.

In line with the increased earnings in 1950, and giving effect to the payment of dividends in cash and retirement of funded debt of several companies, the working capital position of the 30 companies showed an improvement of 15 percent. Such net working capital totaled $4,017,592,000 at the end of 1950 compared with $3,493,888,800 a year earlier. Of the 30 companies, seven showed reductions of which the largest was for Standard of California amounting to about $48,000,000. Smaller reductions were shown by Seaboard, Union, Houston, Richfield, Texas Gulf Producing and Sinclair.

The largest increase in working capital was shown by Standard of N. J. It amounted to $200,000,000, and was followed by Socony-Vacuum which increased by $59,000,000 in 1950; Gulf by $54,000,000; Shell by $41,700,000; Sunray by $22,000,000 largely because of additional financing in connection with its merger in June, 1950, with Barnsdall Oil Co.; and Sun which added about $22,000,000 in 1950.

Funded and/or long term debt of 26 companies in the group of 30 amounted to $2,558,193,000 at the end of 1950 compared with $2,679,771,000 a year previously, a reduction of $120,000,000. The largest reductions in debts were shown by Cities Service, Standard of California, Standard of Indiana and Standard (N.J.), while moderate increases were made by Humble, Phillips, Sun, and Pacific Western. Sunray, in connection with the merger with Barnsdall, increased its long term debt by $52,000,000.

In the accompanying tabulation is shown the net income, per share earnings on common stock, net working capital, and other pertinent facts on the 30 American oil companies during 1950 compared with three previous years, and similar facts for two foreign affiliates of Standard Oil Co. (N.J.); namely Creole Petroleum Corp. and Imperial Oil Ltd.



Comparison of net working capital, funded debt, net income and dividends paid by oil companies in the past four years.

FOUR YEARS FINANCIAL REVIEW OF

	Net Income	Per Share of Com.	Net Working Capital	Net Capital Assets	Funded and or Long Term Debt	No. of Pref. Shares	No. of.Com. Shares		Surplus
Amerada Corp.									
1950	$15,399,607	$9.75	$24,942,549	$43,941,394	.....	.....	1,577,350		$57,357,833
1949	14,384,193	9.12	21,343,683	40,883,360	.....	.....	1,577,350		51,322,326
1948	22,642,252	14.35	28,503,469	32,131,671	.....	.....	1,577,350		44,824,883
1947	14,919,626	9.46	19,050,060	23,891,321	.....	.....	1,577,350		31,646,731
Atlantic Refining Co.									
1950	40,841,508	13.09	65,979,784	278,356,502	$33,120,557	352,000	2,987,326		282,651,196
1949	27,210,432	9.51	54,697,673	271,811,844	34,534,054	477,980	2,660,911		179,954,862
1948	36,657,124	12.68	49,636,811	251,779,652	27,890,000	499,980	2,660,911		189,978,172
1947	15,897,652	5.32	57,559,600	224,124,639	34,210,000	500,000	2,660,867		131,137,496
Cities Service									
1950	56,659,025	14.57	182,898,128	590,717,688	354,844,281	.....	3,889,977	(C)	238,296,843
1949	55,057,822	14.16	186,542,106	612,656,328	423,944,945	.....	3,702,000	(A)	290,366,048
1948	66,777,039	17.17	161,867,520	657,955,713	512,082,756	.....	3,702,000		221,112,982
1947	40,464,786	10.93	134,090,822	650,027,901	487,244,688	.....	3,702,000		176,497,841
Continental Oil Co.									
1950	42,406,666	8.73	69,198,132	156,418,852	466,869	.....	4,858,458		221,926,717
1949	36,096,880	7.48	57,100,861	152,660,205	1,427,783	.....	4,823,858		202,397,966
1948	54,216,729	11.24	59,351,463	136,635,762	1,475,475	.....	4,823,458		185,594,215
1947	31,856,963	6.61	38,971,853	119,081,476	1,790,493	.....	4,747,155		144,615,436
Creole Petroleum Corp.									
1950	166,930,337	6.45	107,225,476	473,899,905	.....	.....	25,865,310		297,765,346
1949	116,149,079	4.49	7,749,771	491,112,483	.....	.....	25,865,310		218,777,068
1948	188,655,625	7.68	19,077,028	440,614,942	.....	.....	25,873,510		295,520,639
1947	130,750,261	5.06	29,956,350	313,568,324	.....	.....	25,865,110		199,636,860
Gulf Oil Co.									
1950	111,139,665	9.89	255,627,511	706,965,875	185,301,460	.....	11,346,520		614,697,783
1949	100,877,041	8.89	205,847,853	698,395,698	189,969,415	.....	11,345,250		548,839,178
1948	153,539,299	13.53	213,486,462	661,757,676	184,874,046	.....	11,345,250		482,097,887
1947	95,540,059	10.53	129,541,065	577,520,002	184,601,035	.....	9,076,202		307,683,569
Houston Oil Co.									
1950	5,905,345	5.37	6,227,102	41,579,596	$8,200,000	.....	1,100,000		$18,388,138
1949	5,786,727	5.26	6,927,688	44,368,994	8,700,000	.....	1,100,000		21,536,279
1948	6,092,536	5.53	5,927,654	42,689,507	9,100,000	.....	1,100,000		18,496,098
1947	4,046,093	3.67	7,271,351	37,826,791	9,500,000	.....	1,100,000		14,600,799
Humble Oil & Refining Co.									
1950	129,359,991	7.20	152,914,043	679,566,241	57,764,972	.....	17,975,680		304,354,492
1949	120,479,526	6.70	138,187,401	631,071,368	50,534,013	.....	17,975,680		247,397,221
1948	186,068,579	10.35	159,063,661	560,663,995	49,491,000	.....	17,975,680	(B)	198,820,415
1947	124,106,877	6.90	116,481,276	481,680,767	42,366,492	.....	17,975,680		259,854,556
Imperial Oil, Ltd.									
1950	30,460,567	1.12	162,916,043	170,770,899	58,262,591	.....	27,133,843		176,924,963
1949	23,932,985	.88	150,556,513	142,778,195	59,657,401	.....	27,133,483		159,769,158
1948	22,832,070	.84	110,578,101	96,938,105	39,897,060	.....	27,121,405		133,329,490
1947	20,464,381	.75	67,164,791	76,561,041	24,000,000	.....	27,090,590		72,161,435
Lion Oil									
1950	13,988,245	5.96	14,654,736	58,582,040	25,000,000	.....	2,340,833		38,563,127
1949	9,115,161	3.89	13,522,145	50,827,228	25,000,000	.....	2,340,813		28,903,938
1948	11,722,432	5.01	16,316,285	38,091,088	20,000,000	.....	2,340,813		23,299,963
1947	7,991,287	3.42	9,329,424	20,063,888	5,150,000	.....	1,170,355		14,243,294
Mid-Continent Petroleum Corp.									
1950	15,862,632	8.43	52,069,834	76,822,095	.....	.....	1,857,912		108,299,444
1948	12,080,615	6.50	46,504,343	73,068,253	.....	.....	1,857,912		93,815,089
1948	24,681,992	13.28	47,819,261	65,371,738	.....	.....	1,857,912		89,219,111
1947	17,639,933	9.49	42,257,012	52,318,269	.....	.....	1,857,912		73,547,597
Ohio Oil Co.									
1950	37,349,963	5.69	57,483,289	134,269,828	.....	.....	6,563,377		113,279,498
1949	33,658,767	5.13	52,084,439	121,033,046	.....	.....	6,563,377		93,650,707
1948	49,333,158	7.52	44,052,972	111,654,130	.....	.....	6,563,377		75,087,696
1947	29,161,496	4.44	40,339,466	95,033,850	3,000,000	.....	6,563,377		59,576,609
Pacific Western Oil Co.									
1950	5,863,638	4.27	4,054,653	19,607,952	14,700,000	1,333,607	1,374,007		21,208,985
1949	4,973,830	3.62	2,013,861	19,407,521	14,000,000	.....	1,374,007		29,085,415
1948	7,305,434	5.32	2,575,785	18,333,678	.....	.....	1,374,007		24,592,481
1947	3,811,936	2.77	2,609,318	14,750,449	.....	.....	1,362,273		17,873,207
Phillips Petroleum Co.									
1950	51,557,264	8.51	93,689,850	465,758,945	123,537,693	.....	6,064,968		237,452,779
1949	44,514,371	7.36	87,299,342	429,938,398	111,719,146	.....	6,048,869		211,729,714
1948	72,630,997	12.01	72,811,100	395,573,850	99,793,245	.....	6,046,917		179,240,920
1947	40,893,647	8.11	66,276,074	291,891,242	41,884,723	.....	6,045,106		124,039,395
Plymouth Oil									
1950	8,498,425	7.01	9,396,626	39,384,664	14,517,033	.....	1,212,683		26,682,266
1949	6,171,587	5.12	8,429,122	35,792,395	14,761,746	.....	1,205,925		22,186,672
1948	6,804,616	6.38	2,450,786	18,126,383	4,110,662	.....	1,067,948		13,175,197
1947	4,197,420	4.01	2,752,830	16,081,039	5,246,876	.....	1,047,488		9,580,674

UNITED STATES OIL COMPANIES

	Net Income	Per Share of Com.	Net Working Capital	Net Capital Assets	Funded and or Long Term Debt	No. of Pref. Shares	No. of Com. Shares	Surplus
Pure Oil Co.								
1950	$30,229,894	$7.06	$67,253,125	$207,241,213	$27,671,966	442,434	3,981,981	$164,327,909
1949	26,977,116	6.22	58,433,570	196,085,492	28,366,321	442,434	3,982,031	144,892,887
1948	41,672,136	9.91	57,696,334	181,984,681	30,665,823	442,434	3,982,031	127,223,016
1947	21,197,069	4.77	49,952,231	157,628,084	32,556,242	442,434	3,982,031	95,026,757
Richfield Oil Corp.								
1950	23,046,378	5.76	59,536,033	108,406,789	50,000,000	.....	4,000,000	43,811,221
1949	20,434,099	5.11	64,663,772	92,927,181	50,000,000	.....	4,000,000	27,764,342
1948	16,751,475	4.19	48,556,017	72,552,382	25,000,000	.....	4,000,000	27,330,743
1947	11,853,397	2.96	28,724,322	60,799,811	1,000,000	.....	4,000,000	18,579,267
Seaboard Oil Co.								
1950	6,106,621	4.99	9,427,456	17,892,426	.....	.....	1,223,123	24,790,775
1949	5,781,347	4.71	9,512,775	13,988,138	.....	.....	1,226,730	21,876,673
1948	6,780,713	5.52	8,290,539	13,028,979	.....	.....	1,228,390	18,548,772
1947	5,941,002	4.83	8,184,998	8,784,163	.....	.....	1,229,230	14,226,425
Shell Oil Co.								
1950	90,121,182	6.69	188,169,447	343,381,787	117,307,000	.....	13,470,625	260,624,337
1949	76,422,775	5.67	146,408,432	342,926,204	120,672,000	.....	13,470,625	211,815,030
1948	111,896,447	8.27	128,595,023	333,981,804	121,797,000	.....	13,470,625	161,546,396
1947	59,874,698	4.44	114,673,825	276,657,990	122,995,000	.....	13,470,625	104,719,558
Sinclair Oil Corp.								
1950	70,193,146	5.31	175,751,714	469,915,650	177,049,724	.....	13,077,626	423,281,866
1949	54,073,338	4.51	192,670,120	418,045,905	182,410,088	.....	11,973,984	380,968,272
1948	81,048,602	6.76	185,922,695	387,116,078	179,588,687	.....	11,974,003	350,838,098
1947	(F) 52,432,125	4.37	(F) 188,291,510	(F) 333,533,008	(F) 181,371,677	.....	11,974,021	(F) 294,424,410
Skelly Oil Co.								
1950	28,514,066	(D) 10.91	27,656,120	155,934,655	14,139,629	.....	2,611,872	104,652,744
1949	26,186,500	20.04	19,752,410	140,489,953	14,000,000	.....	1,306,134	128,190,677
1948	38,914,350	34.04	31,846,707	109,483,085	14,886,338	.....	1,079,476	111,635,500
1947	21,090,936	21.49	21,912,251	88,030,295	15,400,000	.....	981,342	77,887,985
Socony-Vacuum Oil Co., Inc.								
1950	128,216,683	4.03	314,519,119	819,633,241	173,000,000	.....	31,801,880	691,414,860
1949	98,329,305	3.09	255,232,100	771,397,675	174,500,000	.....	31,801,880	606,122,626
1948	132,800,055	4.18	270,386,514	732,890,440	185,000,000	.....	31,801,880	542,764,612
1947	97,708,927	3.13	265,646,171	637,748,563	140,000,000	.....	31,178,319	450,406,319
Standard Oil Co. of California								
1950	156,804,105	5.26	189,925,412	852,475,966	95,210,531	.....	28,673,192	612,926,319
1949	(C) 136,017,835	10.10	237,858,559	772,735,397	140,235,048	.....	13,654,150	543,742,703
1948	161,491,932	12.42	171,851,490	689,503,958	107,217,702	.....	13,654,150	467,365,679
1947	107,268,575	8.25	103,273,784	606,011,265	44,796,559	.....	13,003,953	384,447,312
Standard Oil Co. of Indiana								
1950	123,581,477	8.09	304,757,868	1,049,056,793	261,630,025	.....	15,284,772	783,598,396
1949	102,648,228	6.72	269,263,654	1,022,452,070	286,946,517	.....	15,284,772	701,223,890
1948	140,079,246	9.16	197,519,096	975,759,328	249,464,586	.....	15,284,792	636,601,618
1947	94,880,715	6.21	199,715,280	797,689,716	174,346,231	.....	15,284,806	542,749,899
Standard Oil Co. (N. J.)								
1950	406,223,223	13.45	1,047,131,127	2,125,404,704	441,024,197	.....	30,251,545	1,330,374,554
1949	268,869,501	8.91	847,264,604	2,085,721,726	475,710,293	.....	30,183,394	1,572,656,868
1948	365,604,976	12.44	659,838,746	1,858,675,283	280,426,922	.....	29,385,435	1,430,465,470
1947	266,626,580	9.83	690,068,515	1,524,122,335	218,503,349	.....	27,333,742	1,134,478,936
Standard Oil Co. of Ohio								
1950	20,221,345	5.30	82,296,166	136,023,718	37,689,265	242,294	3,642,720	186,811,561
1949	16,142,164	4.26	58,321,473	128,821,813	36,543,089	247,900	3,574,371	96,363,898
1948	23,783,197	6.39	67,189,680	112,937,258	36,694,040	248,550	3,572,693	88,826,256
1947	16,390,585	4.41	36,923,998	101,377,991	16,257,945	253,225	3,504,325	72,963,521
Sun Oil Co.								
1950	36,291,496	6.82	78,215,209	197,626,162	7,696,000	93,197	5,967,634	(E) 57,692,416
1949	25,177,875	4.57	56,270,746	183,579,729	6,000,000	93,197	5,427,483	(E) 52,254,581
1948	42,853,839	8.61	56,413,048	159,135,242	829,494	93,197	4,934,257	(E) 57,092,279
1947	24,339,913	5.28	47,718,318	134,586,585	1,005,648	93,197	4,534,000	(E) 42,155,774
Sunray Oil Co.								
1950	(G) 29,467,879	2.97	23,528,394	212,136,101	78,006,000	2,784,569	8,456,352	99,596,608
1949	30,646,070	1.77	19,342,939	99,111,868	26,000,000	1,781,227	5,062,143	20,237,090
1948	15,644,234	2.78	24,515,982	93,912,442	20,000,000	1,784,787	5,650,182	20,023,742
1947	10,008,610	1.81	8,023,527	86,186,292	31,442,500	261,900	4,...94,647	19,538,978
The Texas Co.								
1950	149,071,743	10.82	346,781,502	769,034,178	178,805,442	.....	13,774,581	784,935,922
1949	132,743,159	9.62	321,188,140	742,055,255	180,128,177	.....	13,787,624	686,659,536
1948	165,980,980	12.03	257,156,851	623,009,802	164,206,610	.....	13,797,624	609,058,805
1947	106,312,617	7.90	263,780,648	487,204,696	146,846,291	.....	13,461,096	492,110,494
Texas Gulf Producing Co.								
1950	3,072,230	2.78	2,007,514	16,713,065	2,488,589	.....	1,106,000	5,635,685
1949	3,381,359	3.13	2,125,816	16,392,892	4,000,000	.....	1,080,707	3,892,876
1948	3,820,045	3.72	2,063,854	15,017,379	5,000,000	.....	1,029,771	11,660,788
1947	2,345,129	2.30	787,084	13,963,331	5,600,000	.....	1,017,339	6,793,961
Tide Water Associated Oil Co.								
1950	33,364,115	5.17	65,250,178	176,299,743	.....	.....	6,396,589	190,091,871
1949	27,518,705	4.29	62,886,797	176,302,399	.....	172,135	6,396,809	167,952,298
1948	39,387,374	6.04	54,708,056	148,523,625	.....	190,480	6,396,809	151,449,853
1947	30,175,955	4.57	55,585,548	153,000,270	4,500,000	225,373	6,396,809	135,748,023
Union Oil Co. of California								
1950	17,177,547	3.09	57,635,576	254,500,960	79,400,000	245,000	5,266,270	79,222,185
1949	20,356,946	3.69	58,670,963	249,372,269	79,700,000	247,500	5,266,270	82,192,931
1948	31,292,147	6.51	49,727,187	194,501,941	54,400,000	250,000	4,666,270	69,947,452
1947	18,910,860	3.85	46,129,154	178,407,499	54,600,000	250,000	4,666,270	48,974,218

(A) Includes profit of $27,170,082 on sale of investments. (B) After transfer of $175,000,000 to capital stock account. (C) Adjusted by company. (D) Stated on basis of new capitalization. (E) After deductions for stock dividends. (F) Adjusted to include accounts of Venezuelan Petroleum Co. and subsidiaries. (G) Giving effect to Barnsdale Oil Co. merger in 1950.

The derrick floor is clear of everything except driller's console, rotary table and catworks. The drawworks is located at ground level under derrick floor.

Unusual Diesel-Electric Rig

STANDARD Oil Co. of California is drilling in the Baldwin Hills area of Los Angeles County with a new 2,400 hp diesel-electric rig especially designed for economical drilling of 8,000 to 20,000-foot tests.

The $400,000 rig was designed, manufactured and assembled by Emsco Derrick and Equipment Co. in cooperation with General Electric Co. and other oil field equipment manufacturers from basic ideas presented by Standard of California. Standard was assisted by J. E. Lucas, consultant, in developing many if the basic ideas.

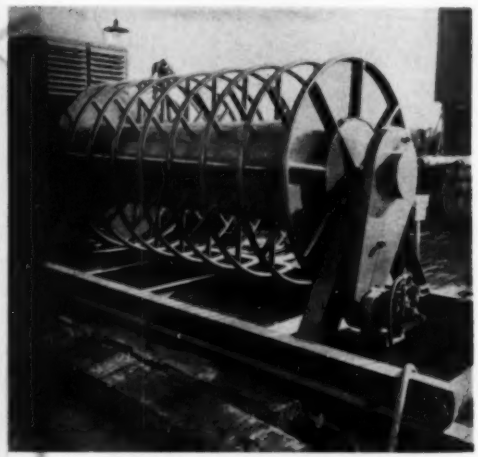
The two diesel engines, six generators and four direct current motors were salvaged from World War II marine equipment and it is estimated that to duplicate the rig using all new equipment would add approximately 75 percent to the cost.

Greater portability in equipment suitable for the deeper holes, improved operating characteristics and lower maintenance were the chief objectives in the design of the rig. All mechanical and electrical units are mounted on skids and are completely "packaged" self-contained units to facilitate rigging-up, tearing-down and moving operations. All units have been designed to comply with California road-width, weight and height restrictions. All heavy machinery is set on ground level to facilitate moving operations and increase stability.

Two 1200 hp, diesel engines drive direct current generators to provide electric power for drawworks, rotary mud pumps and other auxiliary uses. Each diesel engine-driven generator set actually consists of three independent direct current generators, two of which are mounted in line with the engine power-take-off clutch, and the third "v"-belt driven from the end of the second generator shaft. The three generators are as follows: one 1200 kw, 525 volt generator used for driving the drawworks and mud pumps; one 300 kw, 230 volt generator for driving rotary table, and; one 150 kw 125 volt constant potential generator for powering auxiliary units and amplidynes which in turn are used for field excitation of the two larger generators. During normal drilling operations, either of the two 1200 kw main generators is used to drive a mud pump motor, and either one of the two 300 kw generators is used for the rotary table motor. For hoisting service, the driller parallels the two 1200 kw units for driving the 1500 hp drawworks motor. In terms of high gear fast line pull this will provide 29,000 pounds for accelerating and with eight lines strung approximately 10,000 feet of 4½ inch drill pipe can be started from bottom in high.

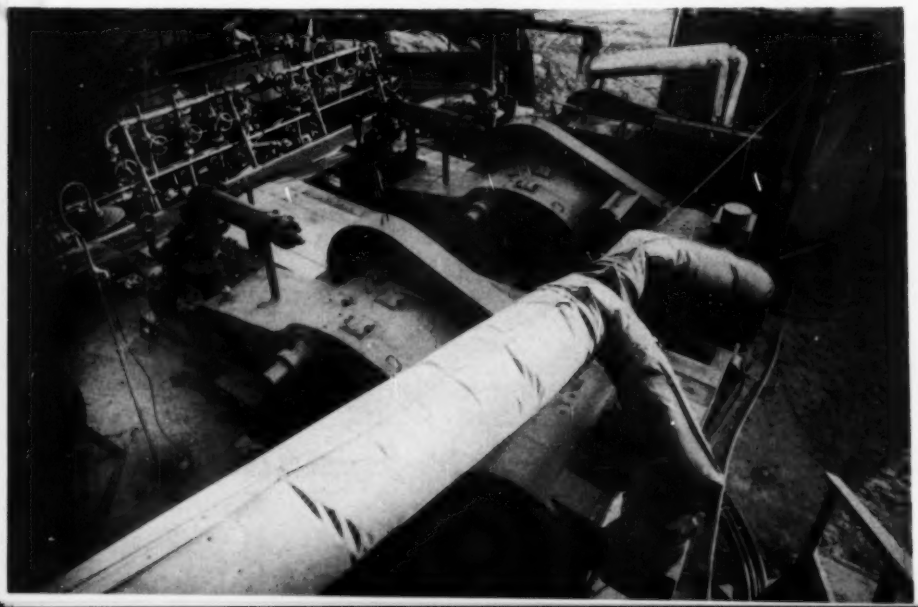
One of the new innovations in arrangement of units comprising the rigs is the setting of the drawworks at ground level under the derrick floor. This eliminates the necessity for a heavy substructure to support this unit. In order to keep the drum fast line within the confines of the derrick, the position of the drawworks has been rotated 180 degrees. Thus, the front of the drawworks actually faces away from the center of the well. The derrick floor is clear of all equipment except console, catworks, and rotary machine table top.

The drawworks is a two-shaft, two-speed unit and is driven by an enclosed fresh air ventilated 1500 hp, 525 volt 600 rpm direct current motor. A direct air-operated friction clutch is provided on the high speed drive, and an air-operated jaw-type clutch, because of space limitations, for the low speed drive. It is expected that the low speed drive will be seldom used. The drum is 32-inches in diameter by 57⅝ inches long and is grooved for 1⅜-inch wire line. The low gear pull of 75,000 pounds on the fast line will handle a maximum hook load of 750,000 pounds with 10 lines strung. Brake rims are 62-inches in diameter and are individually cooled by a forced water circulating system. A unique air system is provided for operating the drawworks brakes from the driller's console



View of ventilating blowers and cable reel skid-mounted unit. The reel is provided for transporting electrical cables. Over seven tons of main power cable are employed.

Two 500 hp slush pumps are driven by air-pressurized, direct-current motors through new type silent chain drives.



on the derrick floor. The brakes are 100 percent air operated. A spring-loaded emergency brake is also provided. This may be operated by the driller in any emergency and is automatically applied in case air pressure should fall below 80 psi. A 60-inch dynamatic electric brake is also provided on the drawworks.

The use of both pneumatic and electric controls permits fingertip operation of the complete rig from the driller's console. In addition to the conventional air controls for drawworks clutches, cathead, air slips, etc., electrical magnetic contractors are provided for selecting the various generator drive combinations. The driller may start, stop, accelerate and switch rotary and drawwork's drives at will. He may select either 300 kw generator for the rotary table drive. Speed control switches are located at the driller's position in fresh air pressurized units. Full motor horsepower is available over a wide range of speeds. Each of the various controllers has an infinite number of speeds from zero to maximum, forward and reverse. This is particularly advantageous for the shaft-driven rotary table where speed and torque can be measured and adjusted for changing drilling conditions.

Either of the two 500 hp slush pumps may be stopped at the driller's position. For safety reasons, restarting and controlling speed may be done only at the mud-pump master switch position. The mud pumps are driven by enclosed fresh air ventilated 765 hp, 500 volt 1120 rpm dc motors. The motor and slush pump are mounted on a common skid base. A new type silent chain, designed for high speed, heavy duty application, is used to drive the slush pumps and drawworks.

The use of dc motor driven slush pumps is expected to considerably reduce pump maintenance. The amplidyne control of the direct current motor gives a drooping speed characteristic which is ideal for slush pump service. Preset maximum torque of the mud pump motors will cause the slush pumps to slow down and stall in case of excessive pressure caused by clogged bit or other restriction of the circulating system. This protects the fluid end from excessive pressures and prevents damage to the power end.

From the original inception of the drilling rig, one of the basic objectives in its design was to provide a highly portable big rig which could be used with equal efficiency for drilling to most depths. The power generating and control units may be set in the most advantageous location to minimize excavation work in hilly terrain.

A large air-motor-driven reel is provided for reeling and transporting the electrical cables. All cables are numbered and coded to facilitate correct coupling, and are equipped with indexing pins to prevent incorrect installation on terminals.

A complete power plant and drilling machinery are assembled on skid-mounted bases. When moving under road-weight limitations, main elements of the drilling rig are quickly dismantled into twelve packages: one skid mounted unit for each of the two diesel engines, one for each of the generator units, one for the electrical control panel, one for the drawworks, one for the drawworks motor and dynamatic brake, one for the rotary machine unit and motor, one for the ventilating blowers and power cable reel unit, and one for each of the two slush pump packages. When moving without limitation the number of packages for the same equipment is eight: two engine generator sets, one electrical control panel, one drawworks with motor and brake, one rotary unit, two pumps, and one blower and cable reel unit.

The main control equipment consisting of necessary control and transfer switches, contractors, relays, amplidynes, alternator and other electrical devices is located in a separate skid-mounted unit. The arrangement of the electrical distribution system permits maximum operating versatility. The main generator units may be paralleled and the power distributed in any desired combination between the two mud pumps and the drawworks motor.

The control system allows the driller to control the output of the largest motors very accurately by turning a small potentiometer dial that is no larger than a radio dial. In addition, the use of amplidyne control provides a means of limiting torque on motors as they can be preset to limit the power that the generator can deliver to the motor.

All electric motors are provided with built-in electric heaters to prevent accumulation of moisture in motor windings when rig is shut-down under high humidity conditions.

Over 3,500 feet of 1,000 MCM cable (approximately two inches in diameter) are used for power connections between generators, motors and control points. This represents a total weight of cable of approximately seven tons.

Three axial flow blowers are utilized to cool motors and to keep a constant supply of fresh, filtered air passing through all electrical units where explosive gases might accumulate. The blowers are located approximately 90 feet from the derrick and are arranged so that the air is picked up seven-eight feet above ground level.

Many safety devices are provided for protection of personnel and equipment. Alarm signal lights are provided at the driller's console to indicate excessive current in any motor. A relay is provided to prevent engine overspeed due to electrical power pump back in event the drawworks motor were inadvertently connected when running pipe in the hole. It is operated by a tachometer mounted on the engine and operates a solenoid valve on the drawworks air brake. An alarm signal operates in case of drawworks motor overspeed. This alarm is actuated by a tachometer on the drawworks motor. A control is provided at the driller's position to kill all electric power beyond load side of main panel in the event of any emergency. Main control panel doors are equipped with electrical interlocks which automatically de-energize the panel when doors are opened.

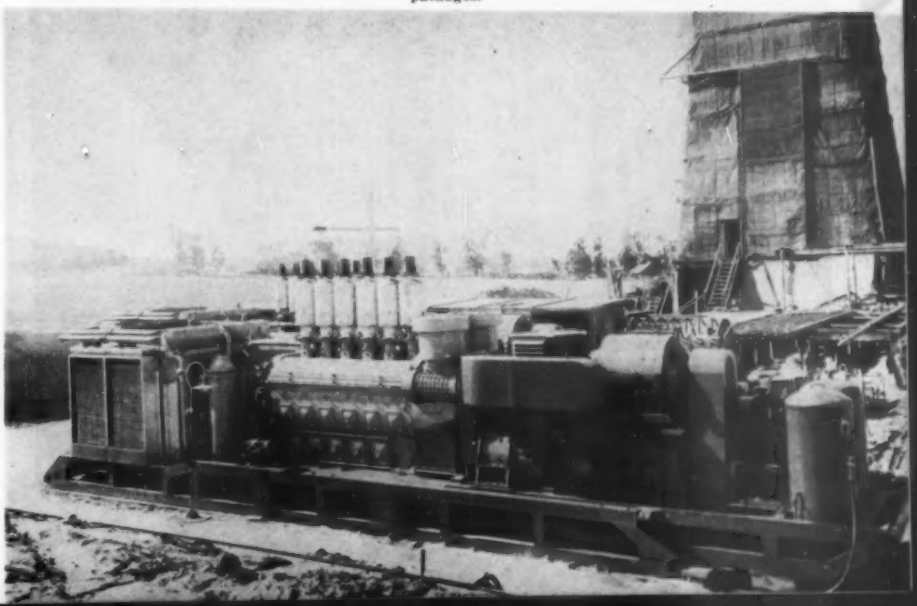
The rotary machine and motor are mounted under the derrick floor on a substructure independent of the derrick substructure. The rotary table is placed practically flush with the derrick floor thus providing extremely safe footing for the drilling crew. This eliminates the need for a heavy substructure.

A universal joint type shaft drive is used between the motor and the rotary table. This permits the table to be shifted 2½ inches in any direction. The use of independent substructure for the rotary table facilitates installation of the blow-out preventers since the table can be lifted out and the blow-out preventers installed from the derrick floor level. Drill pipe setback loads are transferred directly to the ground by means of a special substructure which is independent of the derrick floor.

The two 750 rpm, 12-cylinder diesel engines were previously used in a Navy L.S.T. Originally rated at 900 hp for continuous service, these engines are now rated at 1,200 hp for intermittent duty. A unique cooling system was developed for the oil field application. A fan is mounted at the top of the dual radiator unit and is driven through a right angle gear box from the engine. One radiator unit is employed for engine cooling, while the other is used for water circulating to the lubricating oil cooler.

Fuel is gravity fed from a nearby storage tank, and maintained at a constant temperature by circulation. Due to the use of a relatively low-speed engine, Standard Oil is using a low cost industrial type diesel fuel.

Close up of No. 1 diesel engine driven generator set. Three independent direct current generators are driven by the engine: two of which are on an extension of the engine power take off clutch shaft, and the third V-belt driven from the same shaft. Engine and generators are mounted on separate skids. They may be moved as a complete unit or can be quickly disconnected and transported as two separate packages.



Alkylation Plant Improvements

by D. H. Putney*

THE years 1940 through 1945 witnessed the development of alkylation from a laboratory process to an industry of enormous capacity for the production of aviation gasoline. During those years the push for more and more installed plant capacity led toward standardization of plant designs and away from experimentation or design changes. The years 1946 through 1950 saw a decline in the demand for alkylate and little incentive for spending money to improve the process or increase the capacity of existing plants. With the demand for alkylate again rapidly increasing it is fitting that a critical study of existing plants be made to determine how best to increase production, also to carefully design any new installations guided by experience of the past ten years so that the required quality and capacity are obtained at minimum cost and with the minimum amount of steel, labor and time. To assist in such a study is the purpose of this article.

With a huge defense program in the making, a new aviation gasoline situation has arisen. Not only must the refining industry be in position to supply enormous quantities of aviation fuel but it must be able to produce this fuel to specifications much higher than during World War II. Advances in aircraft engine design now make it necessary to supply a major portion of the aviation gasoline as 115/145 grade. The components of this grade are principally isopentane, alkylate and aromatics. The blending of 100/130 grade aviation fuel normally requires only from 25 to 35 percent alkylate, and considerable alkylate produced from olefins other than butylenes may be used. In the blending of 115/145 grade however, from 70 to 80 percent alkylate is required and this alkylate must be of high quality in order to meet the 145 rich mixture index. Such alkylate must be produced for the most part from butylenes, although as aromatic blending components become available more propylene alkylate may be worked into the blends. In all cases however it is desirable to improve the octane rating of the alkylate so that it will make a greater quantity of finished blend.

With both increased quantity and quality of alkylate required to meet our defense demands it is evident that not only must new alkylation plants be built to utilize available feed stocks but also the existing units should be altered or "modernized" to step up the quality and/or quantity of alkylate where this can be done without large capital investment. Recent process and mechanical studies of alkylation plant reactor sections have disclosed a number of ways in which new alkylation plants may be built better and at lower cost than previous units, and ways in which existing reactor sections may be modified to increase capacity and/or quality with moderate capital outlay. These improvements apply to both the sulfuric acid and the hydrofluoric acid processes. To avoid possible confusion the two processes are discussed separately in the following:

All existing commercial HF alkylation plants are equipped with contactor reactors constructed as shown diagrammatically in Figure I. There were 78 of these reactor units installed during World War II. A few have been dismantled but the great majority are either now operating or could easily be rehabilitated and placed in service. Most of these units are water cooled, as shown in Figure II, while a few are equipped with mechanical refrigeration, as shown in Figure III. All of these plants were built in the haste of getting the World War II aviation gasoline program under way and they were all under construction before appreciable data and experience were available from the first commercial units. It was thought at the time the units were designed that a reaction time of about 20 minutes was required for HF alkylation similar to that required in the sulfuric acid process. Now, however, it is recognized that eight to ten minutes is ample time to complete the reaction. It therefore becomes possible to put 2 to 2½ times as much composite feed to most of the existing reactors and still have ample reaction residence time. The problem becomes one of heat removing capacity since such an

* Vice President, Stratford Engineering Corporation.

HF alkylation plant at Richmond refinery of Standard Oil Co. of California.

increase in feed rate will also increase the load on the contactor tube bundle by 2 to 2½ times. The tube bundle with which the units were originally equipped will not take such an increased load without a corresponding increase in mean temperature difference between the coolant and the reaction mix.

To make possible the increase in capacity of the reactors without increase in reaction temperature a new type tube bundle has been developed as shown in Figure IV which is capable of removing over 2½ times as much heat with the same mean temperature difference as the original tube bundle. The small contactor reactor, known as Size 30, which has an internal circulation rate of 30,000 GPM, was originally equipped with extended surface finned tubes having a total surface of approximately 4800 square feet and a transfer rate of 25 for water cooling. The newly developed tube bundle as shown in Figure IV consists of all prime surface in amount of 4100 square feet and shows an overall service transfer coefficient of 90 for water cooling. The new type tube bundle for the large contactor, known as Size 50 and having 50,000 GPM internal circulation, consists of all prime surface in amount of 6600 square feet and also shows a transfer rate of 90 for water cooling as compared to the original finned tube bundle having 7700 square feet of extended surface and showing a transfer rate of only 25.

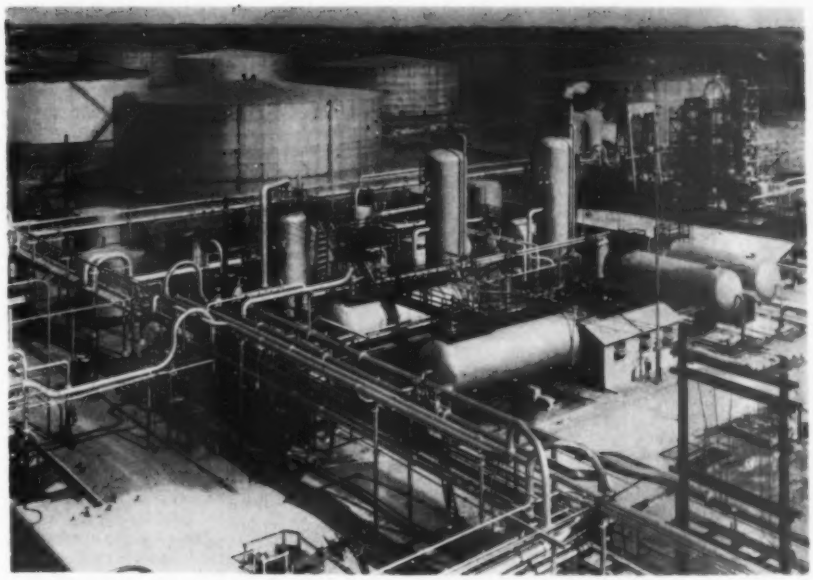
All the new type bundles for both sizes of contactors consist of U-tube elements constructed of 1 inch O.D. No. 11 BWG seamless tubing without welds or joints except where rolled into the tube sheet. The elimination of all welded joints and welded plugs in the tube bundle elements is a definite advantage since nearly all of the tube failures in the past have occurred at welds.

Aside from the ability of the new type U-tube bundle to make possible a large increase in capacity for existing contactor reactors there is its ability to lower the reaction temperature in cases where the feed rate is either not increased or is increased to less than 2½ times the original feed rate. In units where the feed rate remains as originally designed the new tube bundles will remove the heat with a mean temperature difference of only approximately 40 percent of the original design figure. This is of particular significance in the light of recent findings that as the reaction temperature is decreased in the HF alkylation of butenes, the F4 rich mixture index number of the alkylate is increased, at least in the operating range from 110°F down to 60°F.

On present water cooled units where the application of mechanical refrigeration is being considered to further decrease the reaction temperature, the new type bundle offers a means of reducing capital investment costs and operating costs in the refrigeration plant. The original tube bundles with finned tubes realized a service transfer coefficient of only 20 on propane refrigeration applied to the 4800 square feet of extended surface in the Size 30 contactors and 7700 square feet in the Size 50 contactors. The new type bare U-tube bundles show a service transfer rate of 60 on propane refrigeration applied to 4100 square feet of bare surface in the Size 30 contactor and 6600 square feet in the Size 50.

The U-tube bundle is interchangeable with the original bundle. Existing channel and channel cover can be used by simply installing a baffle plate in the channel. Where water cooling is used this is the only change required. In cases where mechanical refrigeration is to be used it is necessary to pump the refrigerant through the tube bundle as shown diagramatically in Figure V. A number of manufacturers offer standard pumps for this service, circulating a large quantity of refrigerant at very low head and requiring only about three to five hp per contactor. The original finned lance type tube bundle required no refrigerant pump since flow could be established by the difference in density of the down-flowing all-liquid refrigerant stream in the lance tubes and the up flowing vapor liquid mixture in the annular spaces between the lance tubes and the finned outer tubes.

The original HF alkylation contactors with which all plants built during World War II were equipped with vertical units as shown in Figure I. These contactors required considerable structural steel for support and for servicing. The amount of this structural steel approximated 30 tons for a single Size 50 contactor or 50 tons for a two Size 50 contactor plant. Moreover, the drives of these machines involved the use of both parallel shaft reducing gears and right angle gears.



First commercial alkylation plant in the United States built to produce alkylates for 100-octane aviation gasoline at the Baytown, Texas, refinery of Humble Oil and Refining Co.

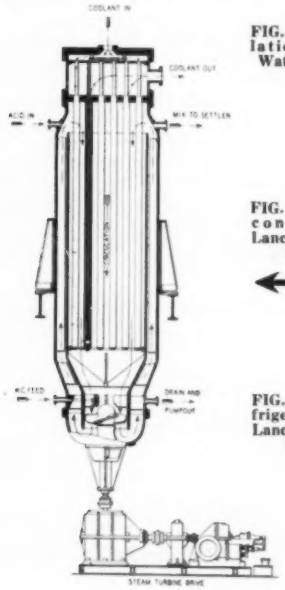
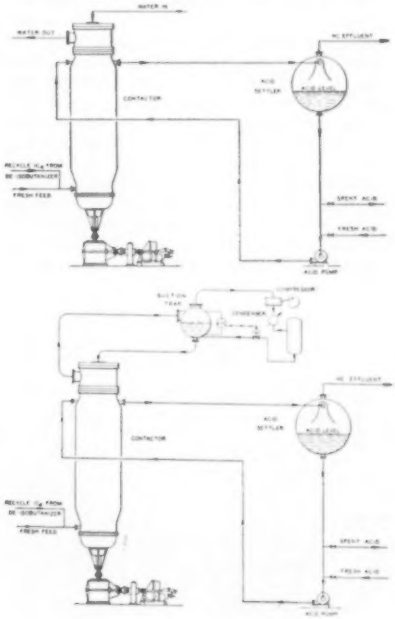


FIG. II—Alkylation Unit—Water Cooled.

FIG. I—Vertical contactor, Lance type tube bundle.

FIG. III—Refrigerated unit, Lance type tube bundle.



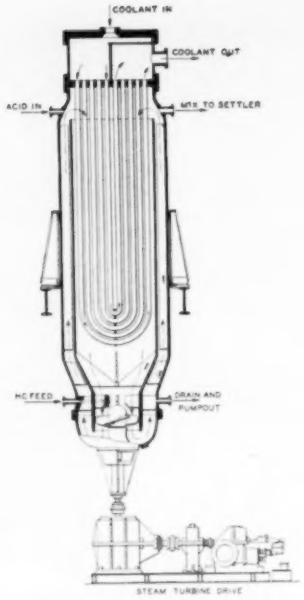


FIG. IV—Vertical contractor, U-tube bundle.

This necessitated the setting and alignment of four pieces of machinery—contactor, right angle gear, parallel shaft gear and turbine.

The new type contactor is a horizontal machine as shown in cross section assembly in Figure VI. It is mounted directly on a concrete foundation in steel saddles which are made a part of the contactor shell. The only structural steel required is a small amount in the form of trolley beams and their supports for use in pulling or reinserting the tube bundle at one end of the contactor and for removing the hydraulic head at the other end. To install this servicing steel permanently for each contactor requires only about seven tons per machine for the Size 50 and six tons per machine for the Size 30.

The drives for the horizontal contactors are greatly simplified. In the case of motor driven units gears are eliminated and the drive is by means of an explosion proof motor directly connected to the contactor shaft through a flexible coupling. Drive for the Size 30 contactor is a 900 rpm motor, and for the size 50 a 514 rpm motor. In the case of turbine driven contactors it is of course necessary to employ reducing gears for best turbine efficiency, but these are simple parallel shaft gears and the right angle gears used on the old vertical units are eliminated.

Not only is the equipment cost of the new type contactor and drive considerably less than the old vertical type unit but there is also a considerable saving in erection costs. Foundations need not be spread to the extent required for the previous tall structures with wind loads. Approximately 18 to 23 tons less structural steel are required for each Size 50 horizontal contactor and there is no structural steel requiring fireproofing. There are only two shafts to align instead of six. Piping is shortened and simplified by all being at low elevation. For units with mechanical refrigeration the suction traps are mounted above and supported on the contactor shells. No refrigerant pump is required since thermo-syphon flow can be established in the U-tube type bundle when it is in horizontal position. There is even the possibility of eliminating the acid circulating pumps by elevating the acid settler and introducing the acid return line from the settler at the suction side of the contactor impeller. The total of all these savings in equipment, erection time, and erection costs not only represents a considerable sum of money but it also means a considerable saving in tonnage of steel required at a time when steel conservation is necessary.

There were 64 alkylation contactor reactors built for sulfuric acid catalyst during World War II, most of which are now in operation. All of these are of the general type shown in Figure III. It is necessary when employing sulfuric acid as the catalyst that operating reaction temperatures be held in the range of 40 to 60 degrees and therefore all such units are refrigerated. Some use ammonia as the refrigerant, a considerable number use propane and a few use isobutane.

The contactors in all of these units were originally of the type shown in Figure I, although some of them are now being modernized with new high capacity tube bundles as illustrated in Figure IV and with refrigerant pumps installed as shown in Figure V. The U-tube bundle for sulfuric acid contactor reactors is the same as described previously for hydrofluoric acid service. It will provide 2½ times the heat removing capacity of the original extended surface tube bundle for the same MTD or will take care of the same heat removal for only 40 percent as much MTD as the original tube bundle. This makes possible a higher suction pressure to the refrigerant compressors and an increased capacity of existing refrigeration units, provided auxiliary equipment is of ample size.

Some of the existing sulfuric acid alkylation units which include more than one contactor are operating with all contactors discharging acid-hydrocarbon mix into one common settler and recycling acid from this settler to each of the contactors. The acid strength in all contactor reactors is thus at the same level. Such an operation can be improved by the installation of an additional settler or settlers or by the division of the existing settler into separate settling zones so that the acid strength can be carried at a different level in each settler. For example, take the case of a plant in which two contactors are operating with a single settler on butene alkylation, where fresh acid is fed at 98 percent strength, where the recycle acid is carried at 90 percent strength and where the rerun yield of 280°F end point aviation alkylate is 93.3 percent of 93.0 ASTM octane. If separate settling zones are provided for the effluent mix from each contactor and the recycle acid from each settling zone is returned to the contactor from which it came, then the acid strength in each of these two contactor-settler systems can be carried at a different level. In the first zone the acid can be fed at 98 percent H_2SO_4 and maintained at a level of, say, 94 percent H_2SO_4. The spent acid from this first contactor-settler system at 94 percent strength becomes the feed to the second contactor-settler system where it is spent down to 90 percent H_2SO_4 and then discarded from the plant. Both contactors are operated in parallel on both butane-butene feed and recycle isobutane. The alkylate which is made in the system operating at the 90 percent H_2SO_4 level will be the same in both yield and octane as it has previously been, but that half of the alkylate made in the system operated at the 94 percent H_2SO_4 level will show an increase in rerun yield of approximately 3.2 percent and an increase in ASTM clear octane of about 1.2 points. With three or more contactors, each with separate settling zone, the overall improvement is even greater. The curves shown in Figure VII show the effect of recycle acid strength on ASTM octane and rerun yield of 280°F E.P. aviation fraction from a typical case of butene alkylation with all other operating conditions remaining constant.

The latest design of contactor-reactor for sulfuric acid alkylation plants is as shown in Figure VI with bare U-tube bundle and with acid inlet at the suction side of the impeller. For an installation requiring only a single contactor it is connected to auxiliary equipment as shown in Figure VIII. For installations large enough to warrant more than one contactor each contactor is provided with its own settler in order to take advantage of multistage acid operation as described in the preceding paragraph.

Such a unit offers a number of economies as compared to the original vertical type unit. As noted previously under the description of the latest type HF units these horizontal contactors require no steel supporting structures. The drive is by means of a direct connected explosion proof motor with all driving gears eliminated. The suction trap is supported on the contactor shell by means of saddles. Connecting pipe lines are shorter and the piping is simplified by being closer to ground level and by the elimination of the acid recycle pumps. By elevating the acid settler

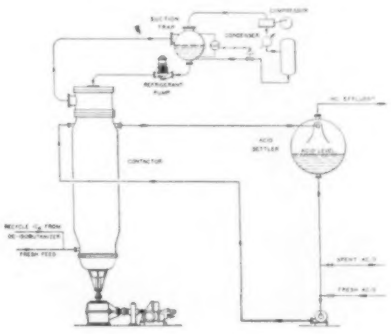
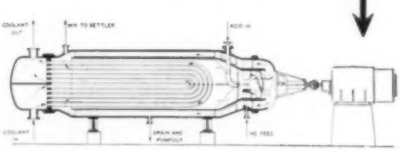


FIG. V—Refrigerated Unit, U-tube bundle.

FIG. VI—Horizontal contractor.



a few feet the recycle acid is returned from the settler to the contactor without the use of a pump. The differential pressure across the contactor impeller runs about 5 psi. The mix outlet from the contactor is taken from the discharge side of the impeller on the upstream side of the contactor tube bundle. By returning the recycle acid from the settler to a point on the down-stream side of the contactor tube bundle at the suction side of the impeller, a major portion of this five pounds differential is available for taking care of the pressure drop across the recycle acid control valve and friction loss in the line. Moreover, with the settler elevated additional pressure is available by reason of the difference in gravity between the HC-acid mix in the line to the settler and the recycle acid only in the acid return line.

A unit of this type for alkylating propylene or mixed feeds is ordinarily installed and operated without the dotted lines shown in Figure VIII. The refrigeration cycle is operated as a closed system, heat being removed indirectly from the reaction zone by exchange through the contactor tube bundle. Change in composition of the feed stock does not affect the refrigeration cycle and no isobutane is evaporated from the reaction zone as in the case of units cooled by self-evaporative refrigeration. Such a system can handle a great variety of feed stocks including propylene and the usually attendant appreciable quantities of propane without disadvantageously upsetting the operation of the refrigeration cycle.

A recommended method for installing new reactor systems is to incorporate the bypass lines indicated by dotted lines in Figure VIII and containing valves lettered A, B, and C. The refrigeration compressors are designed and rated for using isobutane as the refrigerant. When the olefin feed contains appreciable quantity of propane or a high percentage of normal butane then the refrigeration system is operated as a closed system on isobutane, valves A, B and C being closed, and valves D and E being open. When the unit is to operate on a feed stock containing low percentages of propane or other diluent then valves A, B and C are opened while valves D and E are closed. In this way all the hydrocarbon effluent from the settler is passed through the suction trap, is chilled by the evaporation of isobutane therefrom and used as the cooling medium in the contactor tube bundle. The liquid effluent from the suction trap becomes the feed to the deisobutanizer tower which then operates at greatly reduced overhead load. The isobutane evaporated in the suction trap and in the tube bundle is compressed, condensed, and returned to join the composite feed to the contactor. Since all of the isobutane recycled in this manner passes completely through the reaction zone and settler it has the desirable effect of greatly increasing the external isobutane-olefin ratio which is recognized as of major importance in making for high yield and quality of alkylate as well as for low acid consumption. If, for example, with a feed stock as described, the isobutane recycled through fractionation makes for an isobutane-olefin ratio of only three to one and if the refrigeration compressor or condensate is also recycled to the contactor, the net result is a composite feed containing isobutane in amount of between eight and nine parts to each part olefin. None of this isobutane is evaporated from the reaction zone as in the case of self-refrigerated reactors, and it is therefore just as effective in promoting good alkylation conditions as it would be had it been recycled through fractionation at extra cost.

During the past ten years considerable study and pilot plant work has been done on a two stage alkylation process consisting fundamentally of a primary absorption stage wherein the olefins from a hydrocarbon mixture are absorbed in recycle alkylation acid, and a secondary alkylation stage wherein isobutane is alkylated by this olefin-acid mixture. There is no full scale commercial application of this process to date but it has three distinct advantages for future consideration.

First, it makes available for alkylation the large quantities of propylene (and some butenes) which are present in refinery tail gases. In most refineries these olefins are being burned with the tail gases because of their concentration and recovery by conventional means would not be a profitable operation. When more alkylation feed stocks can be utilized the absorption of these olefins becomes economically attractive.

Second, the two stage alkylation process makes it possible to eliminate most of the diluent normal paraffin hydrocarbons (propane and butane) from available liquid hydrocarbon feed stocks. The deleterious effect of these diluents in an alkylation system is well known and where alkylate quality must be improved the process provides a means for so doing by absorbing the olefins from the feed in recycle acid, passing the remaining normal and isoparaffins to fractionation, and alkylating isobutane with the olefin-acid mix from the absorber.

Third, with practically all propane and normal butane eliminated from the alkylation zone as described above the application of effluent refrigeration as shown by dotted lines in Figure VIII becomes very attractive. The vapors from the suction trap will be largely isobutane. When these are condensed and returned to the reactor feed the external isobutane-olefin ratio will be increased five to seven points. It is unnecessary to take this refrigerant condensate through fractionation. All of it passes through the entire reaction zone and none is vaporized therefrom as in the case of units cooled by self-refrigeration. Evaporation occurs in the tube bundle and suction trap after the alkylation reaction is complete and the hydrocarbons have been separated from the acid catalyst. The isobutane refrigerant is then utilized to exert its full beneficial effect throughout the entire reaction zone and, in addition, relieves the deisobutanizer tower of an equivalent overhead load.

As the need for alkylation feed stocks increases, as need for higher alkylate quality arises, or as deisobutanizers become the bottleneck of existing plants this two stage process should be investigated. All the operating conditions of absorber temperature, absorber residence time, acid-olefin ratios, etc. as required for high quality and yields have been well established by pilot plant operation and the process could be applied commercially with very little further investigative work.

In summary it may be said that the capacity of existing HF alkylation contactors can be considerably increased by the installation of new type cooling elements with no increase in power requirements. New HF alkylation contactors are rated up to the capacity of these new cooling elements and are installed in horizontal position without steel supporting structures and with simplified drives, thus effecting large savings in investment cost and utilities for a given capacity.

The capacity of existing sulfuric acid alkylation contactors and existing refrigeration systems can be increased in many cases by the installation of refrigerant pumps and new type cooling elements. New sulfuric acid alkylation reactor systems, employing horizontal contactors with the new type cooling elements are built with simplified drives and without steel supporting structure to effect economics of both material and investment cost. In some cases either new or existing units can utilize the principle of "effluent refrigeration" to greatly increase isobutane olefin ratios. Effluent refrigeration involves the use of the total hydrocarbon from the settler as the refrigerant to the cooling elements of the contactor reactor and the evaporation of isobutane from this hydrocarbon effluent to effect the cooling in the reactor. The evaporated isobutane is condensed and recycled entirely through the reaction zone and settler before again being evaporated within the cooling elements of the contactor.

The two stage alkylation process wherein olefins are first absorbed in recycle acid prior to their introduction into the reaction zone offers possibilities for increasing the supply of available olefinic alkylation feed stocks and for improving the quality of alkylate made from existing feed stocks which contain large quantities of normal paraffins.

FIG. VII—Effect of acid strength on yield and octane.

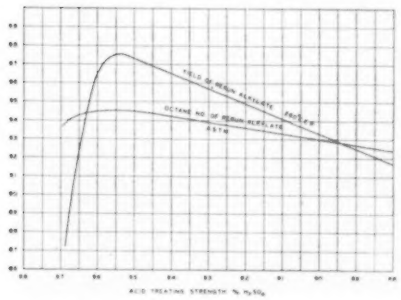
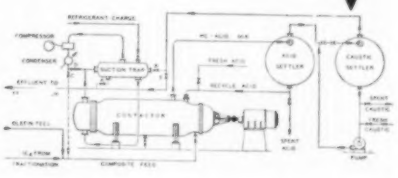


FIG. VIII—H_2SO_4 Alkylation unit.



NOTE—Certain features of process and apparatus described and illustrated in this article are covered by patents issued and pending. Text or illustrations are not to be reproduced without permission of the Stratford Engineering Corp.

Effect of Pulsations in

By Elton Sterrett
Industrial Consultant

THE orifice meter, up to the present time the most practical means of measuring high-pressure natural gas in large volume, presupposes the condition of uniform flow in the stream being measured. If there is not uniform flow, then the volumes and pressures acting through the two manometer leads on the opposite sides of the orifice are not equal, and distorted values are obtained. It is a peculiarity of such deviations that the error is almost always on the "high" side, that is, the meter indicates more gas delivered than the actual throughput.

In the measurement of high-pressure gas from the field or well, a meter run is usually installed to reduce the turbulence and to establish uniform pressure over the entire face of the flowing stream. But a factor frequently overlooked is that the well rarely flows with absolutely uniform volume and unvarying velocity. In the case of a distillate well, the amount of fluid produced fluctuates over a wide range, this fluid content affecting the volume of gas produced to such an extent that sensitive recording devices such as the pulsameter show the heads or surges persisting even through a two-stage separation.

At the pipe line station this factor of pulsation may be introduced by the action of the pistons in a reciprocating compressor. Although the gas being compressed is an elastic fluid, and as such might be expected to suppress or absorb any pulsations set up in it, tests have repeatedly demonstrated that this is not the case, especially when the orifice meter is set close to the compressor. Masson,[1] reporting on a series of experiments designed to test out this effect, states that "in the case of actual flow measurement at a normal compressor station it will be found that, because of a large number of cylinders and a higher running speed, the flow through the meter will be more nearly constant, and as a result the steady flow assumptions may give results which are approximately correct, though the deviations from these results are variable in amount and may be a relatively high percentage, so that measurements made with such pulsating flow will not be accurate enough."

Various types of pulsation snubbers or eliminators have been devised and tried in the effort to reduce the pressure and volume variations across the orifice meter plate. Since experimentation has shown that these pressure variations tend to set up a periodicity or resonance which is a resultant of the interaction of lengths of discharge leads entering the common main, roughness or smoothness of pipe walls, compressor cylinder design, number of working strokes per minute, compression pressure range or difference between suction and discharge pressures and other factors which vary with each installation, considerable work has been done to develop a method for tuning out or leveling the impulse wavefront.

It is possible to develop mathematically and to install practically a branch line which will absorb the effect of the pulsation wave, and thus deliver a uniform flow to the meter, but this solution is applicable only to a very limited range of contributing causes, and may even act as amplification of the wave should basic conditions be changed ever so slightly from the theoretical set of conditions on which the calculations were made.

Since a branch or dead-end stub line to absorb the pulsation front in all probability would require a length too long to be practicable, it has been found feasible to use a shorter branch, making it a definite fraction of the pulsation wave-length. This fraction is usually in ratios of 1:2, 1:4, or 1:8; and always in even increments so that the initial and reflected waves or fractions can reach the junction at a common instant.

With the wave length changing as compressor speeds and other factors are varied, experimentation has been directed toward the development of a device which can readily be adjusted to compensate for these factors. One such eliminator consists of a short length of accurately sized pipe at the outer end of which is fitted a movable piston. By adjusting this piston within the tube the reflected wave can be made to arrive at the junction exactly when desired. For practical use, such a device requires an indicator, such as the pulsameter, to give a reading whereon the effect of piston change and consequent length of effective pipe may be observed. Such a device is capable of being actuated through remote control, monitored by photo-electric cells to observe the variation in pressure waves, and to supervise a motor drive on the screw or other linkage controlling the piston setting.

Changes of volume and direction are also used to break up the continuity of the pulsation wave. Kraus,[2] reporting on the experience of his company in connection with this type of dampener, states that "the length of the larger size of pipe seems very important. Too much pipe was as worthless as too little. Gas volume, large expansion pipe capacity, type, number and speed of engines all had to be considered." He calls attention to the fact that all of the pulsation dampeners sketched (Figure 1) employ the change of direction principle, and that flow into and out of the reservoir or snubbing chamber is to and from the sides of the wall of the "Big Inch" or large-sized pipe used to form the body of the dampener.

Where this type of flow stabilizer is used, it frequently is combined with some type of liquid knock-out or extractor. Certain types of these units are designed so that an accumulation of fluid is always held in the lower of the series of chambers. One such unit utilizes an externally adjusted swing or drain line so that the height of the fluid level with respect to the top of the large diameter pipe forming the chamber can be closely regulated.

By a series of experiments, again with the use of a pulsameter or other method for recording or observing the pulsation waves in the outflowing stream of gas, the liquid level can be adjusted to give maximum damping effect. Extended series of recorded data on one such installation seem to indicate that the effect of the variable liquid level is primarily a function of the diameter of the reservoir chamber pipe, and secondarily of the diameter of the short legs or connecting nipples of smaller diameter pipe tying in the upper volume chamber with the collection unit below.

Use of companion flanges and variable orifice plates in these drop-legs has also been investigated in connection with the adjustable level in the collector sections. This investigation was conducted at a trunk-line compressor station where the equipment consisted of the relatively slow-speed horizontal-type compressors. The discharge main was sectioned to include the end compressor unit and the one adjacent, and a pulsation dampener of the volume-chamber type was installed between this severed portion and the main serving all the units. By varying the speed of the two compressors thus isolated, insofar as their delivery gas streams were concerned, it was possible to vary the periodicity of the recurring highs and lows in the joint delivery stream. Thus the sine wave series representing delivery pressures from Unit No. 1, for instance, could be made to overtake or lap that traced by Unit No. 2 once each minute by a difference of one rpm in their respective speeds, twice by a two rpm difference, and so on.

Under the artificially unbalanced conditions thus set up, experiments seemed to indicate that the ratio between diameters of the drop-leg or connecting pipes or nipples and the orifice plates inserted between the flanges therein installed could mount to 4:1 before the choke would impair the added regulatory or snubbing action of the lower chamber. Beyond this ratio the effect of the lower chamber volume change through varying the liquid

Gas Measurement

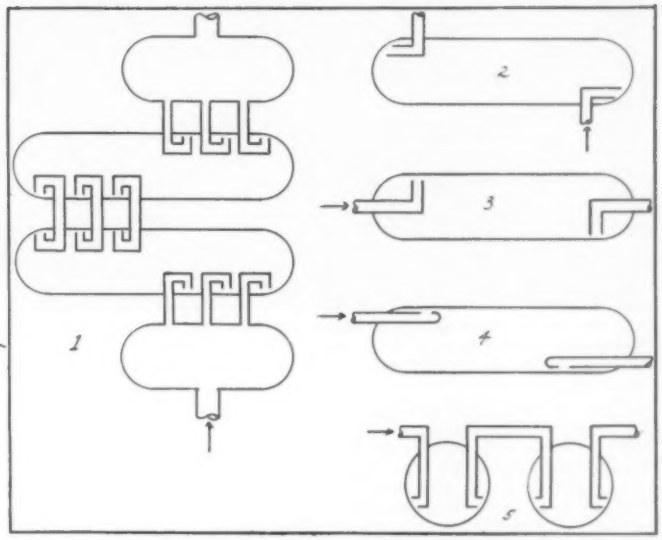


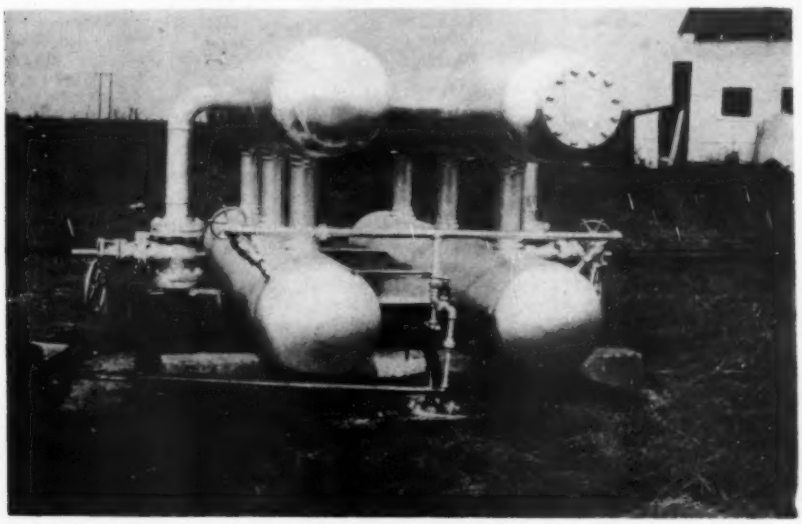
Figure 1—Diagrammatic lay-outs of various change-of-direction and volume chambers used by Kraus in his experiments with this type of equipment for the dampening of the pulsation wave. (1) is effective in reducing pulsation, but adds to the compressor load by reducing the discharge head more than any of the other four types illustrated.

level became progressively less; and at values above 8:1 the effect was practically the same as when a blind was inserted between the flanges.

To allow any liquid separating out in the upper chamber to be drained to the lower without passing through the connecting drop-legs, the ends of the pipe nipples connecting the two big sections were allowed to project a minimum of one inch within each of the volume chambers before being welded into place. To remove condensate, one-inch drain pipes were welded into place to connect both ends of the bottom of the upper chamber with the space in the lower. To minimize splattering or diffusion and possible pick-up of such liquid by the ebb and flow of gas through this small drain, the lower ends were carried down to within one inch of the bottom of the lower chamber, and thus the inlet into the lower liquid collection space was always below the level of the fluid in that chamber.

Entry of the centrifugal compressor or rotary blower into the field of gas trunk-line operation should assist in the accurate metering of flow. The output from such a unit is free of pressure surges, assuming steady-flow delivery to the suction side, and thus can be metered at any convenient point in the station piping without need for correction due to distance for compressor outlet, once the normal requirements for straight-line meter runs as outlined in the requirements set up by the American Gas Association are met, insofar as such standards[3] can be reproduced in pipe line installations.

Figure 2—A snubber in which the liquid level in the lower cylinders can be regulated and the resonance effect of the connecting tubes employed to counteract the waves imparted the metering stream of gas by compressor units. Gas enters from the left, and exits through a similar line to the right, nearly hidden by the tie-in nipples of the right pair of cylinders.



The basic calibrations governing the AGA specifications were obtained through the use of long, straight runs of commercially smooth pipe. Since continued operation tends to vary the internal condition of such pipe, even when periodically swept by scrapers or neutralizer by the use of inhibitors or special linings, allowable deviations from the ideal conditions of the basic runs must be recognized before the values derived from a standard orifice mounting under the special conditions existing at a station or flow line can be used in computations involving immense volumes of gas or equally astronomical amounts of tax, royalty or transmission charges.

Rotary units, when powered by electric motor or either gas or steam turbine, can be relied upon for practically pulsationless output. The same unit, however, when driven by an internal-combustion unit through step-up gearing, may exhibit a pulsation or pressure wave which simulates those set up by reciprocating compressors, though the intensity of the variations observed is much less than with the older type of compressor.

As most of the compressor capacity now installed in the trunk lines of the country is of the reciprocating type, the problem of pulsation dampening to obtain accurate measurement data is one which may be expected to continue to be of increasing import. For the volumes and pressures of deliveries of natural gas to connecting distribution systems and to and from underground peak-load storage reservoirs will continue to be augmented in the ceaseless effort to make greater and ever greater deliveries from the fields of the Southwest to the user areas in the North and East.

References:

(1) Masson, David J. "Results in Experiments with Pulsation Eliminators." Paper before the Ninth Annual Appalachian Gas Measurement Short Course, West Virginia University, Morgantown, W. Va. 1950.

(2) Kraus, A. F. "Measurement and Control of High-Pressure Gas." WORLD OIL, Vol. 131, No. 3 p. 205 (August) 1950.

(3) American Gas Association. "Orifice Meter Report No. 2."

Progress Of The French Search For Oil

The Lacq Field

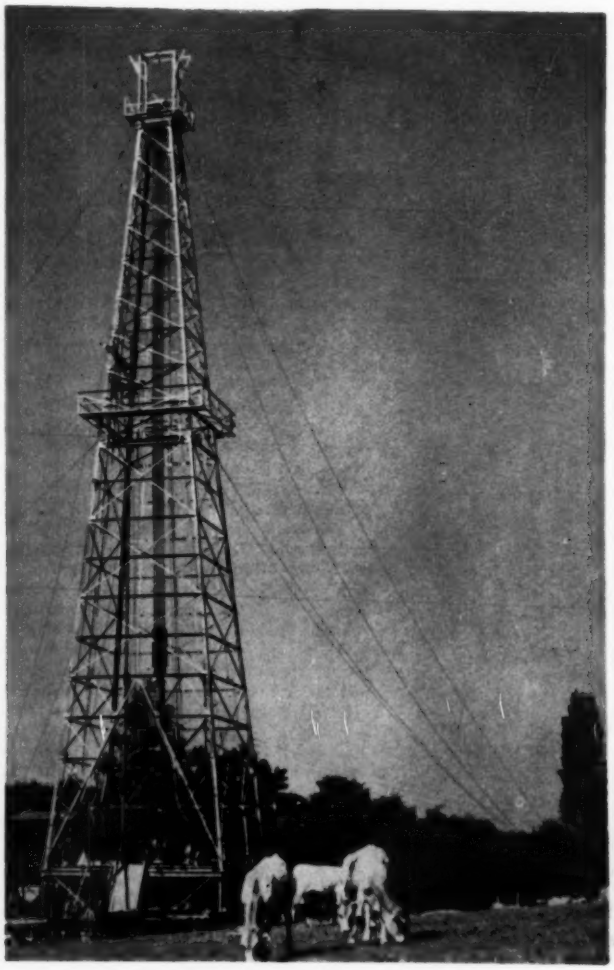
By Jacques Ed. Pellissier

SINCE the discovery of gas in substantial quantity in the southwestern part of France which took place nearly a dozen years ago the search for oil in this region and surrounding areas has been carried on with more or less continuity through the joint efforts of the government and private capital.* It was almost suspended during the German occupation but was resumed after the liberation. Encouragement for its maintenance was given by the evidence provided by a seismic survey of the Aquitanian basin and by the showings of oil in two wells which were drilled there.

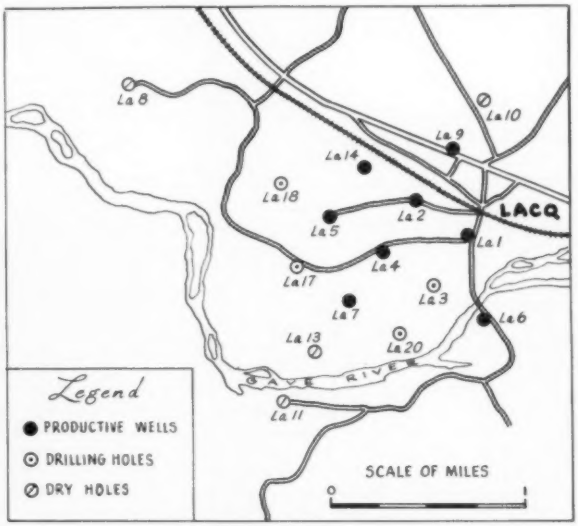
In 1950 this effort was rewarded by the finding of an oil field in the foothills of the Pyrenees near the small village of Lacq about eighteen miles west of the city of Pau. The first well in this field was put on the pump in January of last year and produced at the rate of 77 barrels per day. Since then six flowing wells have been added and are delivering about 4,000 barrels daily.

This result stands to the credit of the Societe Nationale des Petroles d'Aquitaine

*See "Search For Petroleum In France", World Petroleum, February 1950.



St. Medard No. 1 of Soc. Nationale des Petroles d' Aquitaine.



Well locations in Lacq Field.

Exploration areas in Southwestern France.

View from railway station from which Lacq oil is shipped in tank cars in foreground. Two wells in background.

(SNPA) a mixed economic corporation with a capital of 2,480,000,000 francs of which 37.5 percent was provided by private investors. The corporation was created in 1941 by a special law to prospect for oil in southwestern France within an area of 2,800,000 hectares (6,918,000 acres) reserved by the government. In 1950 SNPA drilled 19,513 meters (64,000 feet). It now has five IDECO rigs capable of drilling to 10,000 feet and is adding an IDECO H-40 portable.

SNPA began its work in the eastern portion of its concession in a zone not occupied by the Germans, and during the occupation it purposely drilled at a slow rate. After the liberation operations were shifted westward, where the prospects appeared more interesting.

Two structures, the Garlin and the Bastennes-Gaujacq, were revealed, the first with a show of oil at 1,950 meters (6,396 feet) and the second with evidences of both oil and gas at 4,162 meters (13,651 feet). Detailed study of these two structures was deferred. In the northern portion of the area a well was sunk to 9,840 feet and was shut down. Two wells are now drilling south of the city of Pau, but up to now none of the work in this district has revealed an exploitable formation.

However, things were different at Lacq where a seismic survey made by the Compagnie Generale de Geophysique of Paris disclosed an anticlinal structure. Here the first well, Lacq 1, spudded in October 1949 on the presumed summit of the structure, struck oil in December at 2,099 feet. This well produced 16 barrels per day up to January 16, 1950, when a pump was installed at 1,312 feet raising the output to 77 barrels per day. Its production has been maintained for over a year at about 120 barrels daily with four to 30 percent of water. The company intends to shut down this well and to use it as a control well.

A second well, Lacq 2, about a third of a mile from No. 1, reached the productive horizon at 2,024 feet. Tests with a 1 11/32 inch choke gave up to 319 barrels per hour. In order to protect the reservoir this choke was replaced with a 3/8-inch choke which reduced the production to 1,200 barrels per day.

On May 31, 1950, a third hole, Lacq No. 4 a like distance from No. 1, reached production at 2,093 feet. Like No. 3, the production of this well is limited to 1,200 barrels per day. Since then four new wells have gone into production. The oil of these six wells, all flowing, contains no water.

One of the first holes, Lacq No. 3, also reached production. This well is designed to test the structure in depth and is not in production; by the end of January it was down 8,100 feet.

Another well, Lacq No. 5, entered the oil-bearing formation and is also being used for exploratory purposes.

Thus, at the end of January, out of 12 holes four were dry. Exploration of the structure at Lacq will still require a large amount of drilling which is being done by three rigs plus the deep-exploration rig at work on well No. 3.

The Lacq oil field is of the calcareous type. The productive horizon is relatively shallow (1,640 to 2,300 feet) in the upper Senonien (Campanien). The overburden is rather uniform, as shown by electrical and lithological correlations.

In the present state of information the productive formation does not appear to be very homogenous. However, the calcareous nature of the rocks and the occurrence of fissures in the formation will no doubt allow of obtaining good production.

So far as the work has now advanced, knowledge of the formation is not sufficient to allow a volumetric evaluation of the reserves. However, from the constancy of the bottom-hole pressure in the producing wells—870 psi at 2,033 feet—and the small proportion of gas in the oil (8:1) and the presence in Lacq No. 3 of an extremely thick and porous calcareous layer in connection with the oil, it is known that the Lacq reservoir is of the "water drive" type, characterized by good communications within the formation that give promise of high final recovery.

Exploration and production are being carried on along two perpendicular directions across the field.

From the foregoing it is seen that the Lacq field is now producing practically water-free oil at the rate of about 4,000 barrels per day. This production, gathered from a central group of reservoirs, is pumped to the Lacq station, half a mile distant. From there it is shipped by train in lots of 800 tons (5,600 barrels) to the refinery at Pauillac, some 185 miles away in the neighborhood of Bordeaux. This refinery is owned by the Societe Shell-Berre.

Lacq oil is a naphthenic crude with a specific gravity of 0.92 and 36 degrees viscosity (Engler) and has a sulfur content of 3.87 percent. The very low pour-point of this oil allows it to be easily pumped. The salt content is small. The refinery at Pauillac is obtaining from it 10 percent of gasoline, 20 percent of gas oil and either 70 percent of fuel oil or 20 percent of distillate now used as fuel oil, and 50 percent of bitumen, according to the needs of the refinery.

New administrative set-up has been established in southwest France. Standard Francaise des Petroles (SFP) has obtained, by decree of February 17, 1951, a five-year exclusive permit to search for liquid or gaseous hydrocarbons in an area of 4,356,215 acres immediately northwest of the concession of the SNPA. The general boundaries of this new concession are: (1) the Meridian 1°20″ west of Greenwich which extends across territorial waters from the parallel of the south point of the island of Oleron to the south point of the island of Mimizan; (2) the line Marennes to Montpon-sur-l'Isle; (3) the line Montpon-sur-l'Isle to Agen.

SFP has pledged itself to form a corps of French specialists chosen from the most qualified members of its personnel, and to give these French recruits opportunity to receive instruction in foreign countries, as has been its practice in the field of refining.

It has also formally agreed that, if its offer to carry out the exploitation of the concession or concessions for which it has applied is granted as a result of its research, it will form a special corporation in which the government will have directly or indirectly, a participation to the extent of ten percent and will be assured the benefit of the provisions of article 12 of the law of July 25, 1949. This refers to a financial law which reserves to the government, in the boards of directors of interested companies a number of seats proportional to its participation, the number of such seats not being greater than two-thirds and not less than two.

Finally, the SFP has engaged to assume minimum obligations to cover half the cost of drilling 2,000 meters (6,500 feet) during the first year, starting from a set date, within the normal conditions of operations; during the second year, the cost of drilling 2,000 meters evaluated as above; during the third year, three times the cost of drilling 2,000 meters, evaluated as above; during the fourth year five times the cost of drilling 2,000 meters, evaluated as above; during the fifth year six times the cost of drilling 2,000 meters, the cost of drilling 2,000 meters being estimated at 75 millions of francs under present conditions.

Standard Francaise des Petroles is preparing to place orders for material and to engage the personnel necessary for the first research campaigns.

ENCOURAGING shows of oil were met during May in Pakistan Petroleum's test well No. 4 at Chakwal (Punjab) at a depth of 8,212 feet. Tests are now being made to determine the productive capacity of this well.

In making this announcement Pakistan Petroleum Ltd. recalled that drilling operations started at this well on Jan. 27, 1950, and a depth of 5,176 feet was reached within three months of the beginning of operations. When the well was 6,495 feet deep an unexpected water sand of very high pressure and volume was met which greatly delayed progress. It was only by the end of 1950 that it became possible to drill through this high pressure water sand.

In March 1951, the well was deepened to 8,061 feet to drill into the Sakesar Limestone but indications of oil were very disappointing. The present depth where oil shows have been met is the same as that of Pakistan Petroleum Limited's well No. 2 where oil was struck in June 1949. Well No. 3 was abandoned as a dry hole early this year at 8,939 feet, the same depth as well No. 2 after acidizing and shooting. The same was the rate of Chakwal test well No. 1.

It is reliably learned that Pakistan Petroleum Ltd. is going ahead with its plans to drill other wells in the same area in order to develop the field.

Prior to the last war, the oil situation in Burma and India was well defined. The major production was in Burma, where the three major companies were the Burmah Oil Co., Indo-Burma Petroleum Co. and the British Burmah Petroleum Co. Ltd., while in India, the Assam Oil Co. (where shares are wholly owned by the Burmah Oil Co.) and the Attock Oil Co., Ltd., were the main operators.

With the division of India into India and Pakistan, the only source of production left in India is the Digboi field in Assam. In 1944, Assam had a production of 304,000 tons per annum; this production fell to 247,000 tons in 1947, and is now steady at about that level. Efforts are being made to extend the field and thus increase production, with fair prospects of success. Near Digboi, two test wells at Tiku Hills and Barsilla have recently failed to find commercial production, but the Assam Oil Co. has other prospects to test.

In Pakistan a certain amount of exploration has been carried out, and more is in progress. In Punjab work has been carried out round the existing Attock fields on the extension of small already producing fields, with fair prospects of finding other small fields.

The companies are also exploring Baluchistan, west of Punjab, and report fair prospects of obtaining commercial production in that territory. Exploration has been carried out in Sind at Lakhra, where a well was drilled which gave large quantities of salt water but no shows of oil or gas. The formation through which drilling was done gave little hope of success, so further prospecting in that district has been abandoned.

The oil quest in the forest clad Patharia Hills began in March when the governor of East Pakistan, His Excellency Malik Feroze Khan Noon performed the spudding in ceremony of the first test well of Pakistan's first oil company, Pakistan Petroleum Ltd. Standing at the controls the governor himself drilled the first foot of hole. Speaking on the occasion Malik Feroze Khan Noon gave a brief survey of the efforts of the

On the top of steeply rising line of Patharia Hills covered in dense jungle is the tall 136-ft. drilling derrick.

Oil Conditions In Burma, India And Pakistan

Burmah Oil Co. to tap the oil resources of the Patharia hill tracts since 1917 when the government of undivided India granted the concern a prospecting license. He said that when he took over as governor he had negotiated with the Burmah Oil Co. in Pakistan for the resumption of prospecting.

The manager of the prospecting company, Mr. M. J. Condon, in welcoming Malik Feroze Khan Noon, said that though the company had been granted the mining lease only in the middle of 1950, it had been able to undertake the operations in a few months time. Mr. Condon recalled that the Burmah Oil Co. had in the past drilled two oil wells in the Patharia region one of which produced some oil. He was glad that the settlement of the boundary dispute had enabled the resumption of operations.

Territory on the border of India and Pakistan, to the south of Assam, has shown possibilities, and the companies propose drilling a test well in the near future, at Patharia.

In Burma, which had prewar a production of more than a million tons per annum the situation is totally different. On the invasion of Burma by the Japanese, early in 1942, official instructions were given to the companies to destroy or put out of action all their properties, refineries and plants, which instructions were faithfully carried out. Little rehabilitation was carried out by the invaders though a certain amount of production was obtained, so that at the end of hostilities there was complete chaos in the fields and refineries.

As mentioned previously, the Burma companies effected a merger of their resources, in proportion to the individual resources of the companies, so that in view of the magnitude of the rehabilitation problem, work could be carried out on an orderly and economic basis.

It was planned to build an entirely new refinery at Syriam, which would process the total production of three companies, who at the same time would maintain their own respective distribution organizations.

This arrangement did not however apply to the Burmah Oil Company Pipelines Ltd., which maintains its identity, while agreeing to carry the combined oil production.

On this basis, the rehabilitation of the Burma fields was commenced, and proceeded according to program until the end of 1948, at which time the organization had expended about eight million pounds sterling, but could then see no clear prospect of sufficiently settled conditions developing in the country which would enable it to reap the benefit of this rehabilitation by commencing production and refining. Communist and other insurrections, including that of the Karens, rendered repair and operation of the pipe line impossible.

Production from the rehabilitated wells was confined to that required only for the supply and operation of the small topping plant at Chauk, now increased to about 2,000 barrels per day capacity.

A certain amount of plant is being sent from the Burmah Oil Company's refinery at Syriam to the Chauk refinery, the installation of which will enable better products to be made at that refinery.

At the time, to avoid cessation of operations the British government gave the organization a temporary guarantee against future loss from expenditure on rehabilitation. This guarantee expired at the end of 1949, and as by that time rehabilitation of the fields was practically completed and the organization could not see its way clear to reconditioning of the pipe line and deliveries of oil to the proposed new refinery, until such times as internal unrest subsided and adequate controls were established, it was considered inadvisable to proceed with further work on the fields and refinery. Consequently notices of dismissal had to be served on such of the employees as would reduce their number to that required for the supply of crude to, and that required for the operation of, the Chauk refinery.

The workers, under strong communist incitement, demanded compensation for dismissal, and also that work should be continued on the reconditioning and reconstruction of the refinery at Syriam, and the possibilities of river transport be fully explored for the carriage of crude oil to the refinery.

These demands were referred to the Burma industrial court for arbitration, the court finding that retrenchment at the fields was reasonable, but the discharges illegal, because they were a breach of the Trades Dispute act, and also directed the organization to continue building the refinery.

These awards not being satisfactory to the companies, they appealed to the Supreme Court to have them quashed. The Supreme Court upheld the award as to the discharges at the oilfields, but reduced the compensation to the workers.

The second award regarding the refinery was quashed on the ground that the industrial court had no right to direct the companies to explore the possibilities of river transport for crude oil, when the projected refinery was to be built on the basis of pipe line supplies.

It is impossible to predict what the future may hold for the Burma oil industry. Before the war under British administration, Burma not only had sufficient production to meet her own petroleum needs, but also exported substantial volumes of valuable refined products

(Please turn to page 86)

THE LONDON & MIDLAND STEEL SCAFFOLDING Co. Ltd.

ST. LUKES WORKS, OLD HILL, STAFFORDSHIRE, ENGLAND • Telephone Cradley Heath 6237/8 • Telegrams Dublegrip, Cradley Heath.

LONDON OFFICES: BURWOOD HOUSE, CAXTON ST. LONDON S.W.1 • Telephone ABBey 6483/4 • Telegrams Doublegrip, Sowest, London.

New Catalytic Reforming Process Is Announced by Houdry

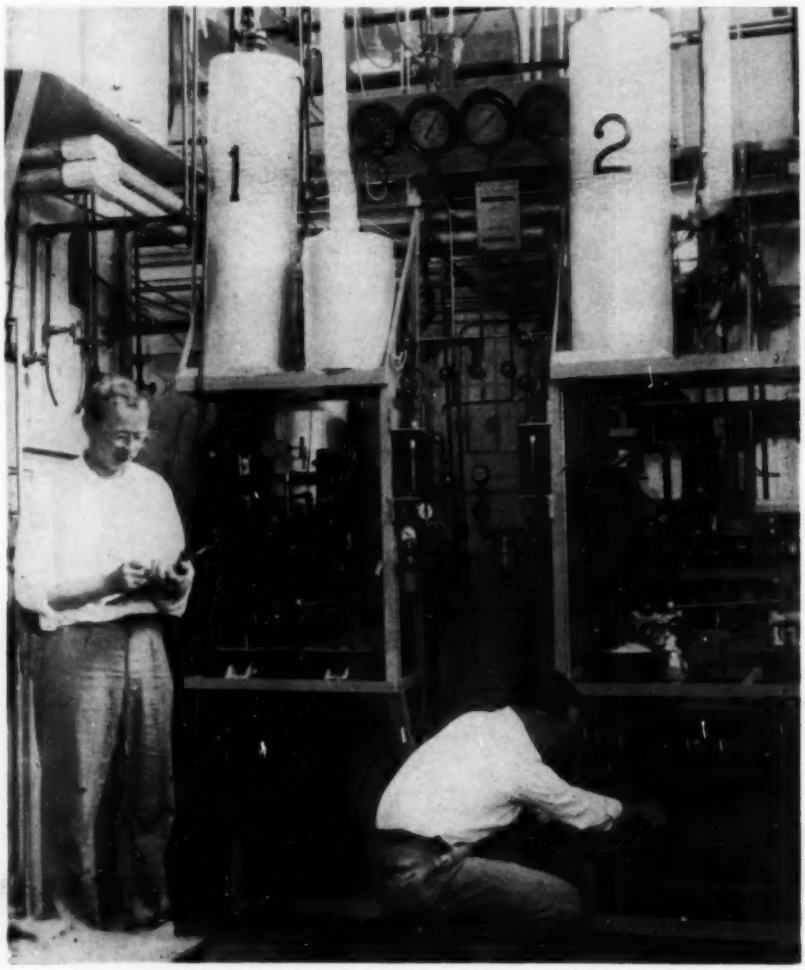
A NEW catalytic reforming process for the upgrading of low octane naphthas and production of aromatics was announced by Houdry Process Corp. at a joint regional meeting of the American Institute of Chemical Engineers and the American Chemical Society at Tulsa on May 16. The new process will be known as the Houdriforming process.

C. G. Kirkbride, Houdry vice president, who presented the paper, reported that dual-function catalysts have been developed for the process. These catalysts are very selective for (1) the dehydrogenation of C_6 ring naphthenes, (2) the dehydro-isomerization of alkyl cyclopentanes, and (3) the isomerization of normal and slightly branched paraffins into highly branched paraffins. Essentially no hydrocracking occurs and, therefore, substantially pure hydrogen (97%) is produced. The catalysts are not affected by sulfur compounds including thiophene. The process is non-regenerative, although for flexibility of operation and for protection in case of error in operation the catalyst can be regenerated in place.

In life tests (30-50 days of continuous operation without regeneration or loss of catalyst activity) in multibed adiabatic units, different charge stocks were processed at widely varying conditions over the same catalyst. A charge stock comprising a 150-220°F. cut of an East Texas type naphtha was used as a base stock and was run periodically at fixed conditions to check the catalyst activity. The properties and composition of this stock are presented in Table I.

The yields of aromatics produced from this charge stock are summarized in Table II. The yield of aromatics increases to very high levels as the severity of operating conditions is increased. A significant fact is that the hydrogen recycle gas and off gas from the unit consists of 97.5-98.5 volume percent hydrogen at all conditions. In this operation gas separation was effected in a simple pressure separator at atmospheric temperature. The yield of hydrogen is better than 90 percent of theoretical based on conversion of naphthenes to aromatics. These facts indicate that the catalyst is very selective and promotes very little hydrocracking at the operating conditions employed.

The pressure of hydrogen obviously has a very powerful influence on the C_6H_6 to C_6H_{12} mole ratio in the product and indeed, in the pressure range studied, is the limiting factor for benzene production at a given temperature. At pressures above 300 psi. the equilibrium amount of benzene falls off rapidly, while the amounts of cyclohexane and cyclopentanes concommitantly increase. On the other hand, the equilibrium toluene concentration remains high to a much higher pressure than for benzene.



Typical pilot plant in Houdry Laboratories.

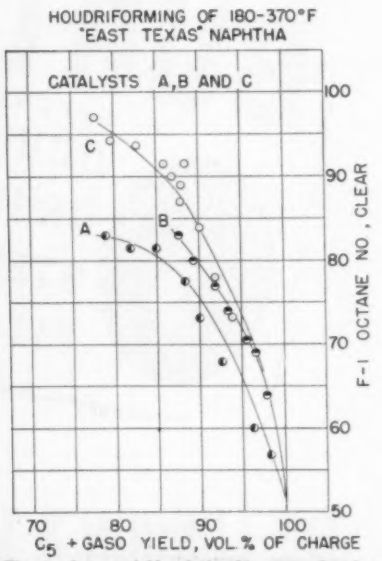
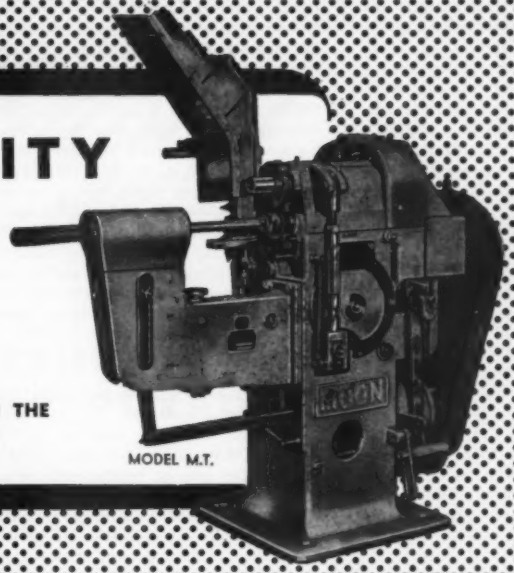


Fig. 1. Octane-yield relationships in reforming East Texas naphtha with different catalysts.

VERSATILITY

- TRIMMING
- BEADING
- CURLING
- KNURLING
- SCREWING

MANY OPERATIONS COMBINED ON THE AUTOMATIC ROUND TRIMMER



MODEL M.T.

This most useful machine will operate on light gauge metal shells from 3/8" min. dia. up to 4 1/4" dia. giving outputs of 60, 70 or 80 per minute, according to size and depth. The illustration shows a selection of typical stampings dealt with by this machine.

Please write for full particulars.

MOON

Regd. Trade Mark

MOON BROTHERS LIMITED, BEAUFORT, ROAD, BIRKENHEAD, ENGLAND

Cables: "Moonbro" Birkenhead, England

LONDON OFFICE: Abbey House, 2/8 Victoria Street, Westminster, S.W. 1
Cables: Moonbro, Sowest, London, England

MAKERS OF TIN BOX AND DRUM MAKING MACHINERY

dm MB 24

Temperature affects the several equilibria to a critical degree. It is evident that isomerization to form methyl cyclopentane offers an important reaction from the standpoint of benzene yield. The maximum yields obtainable in adiabatic operation can be calculated on the basis of thermodynamic equilibrium, the heat of reaction, and the heat capacity of the reaction constituents. Dehydrogenation of naphthenes is highly endothermic and this heat is supplied by the sensible heat of the reaction constituents.

Ordinarily the process is non-regenerative for the production of aromatics from a single wide cut charge stock. However, for most severe conditions on unusually wide boiling range charge, a catalyst deposit may accumulate slowly and the ability of the catalyst to be regenerated provides maximum flexibility. Thus a non-blocked out operation can be employed for the simultaneous production of benzene, toluene and xylenes.

Upgrading of motor gasolines by Houdriforming is accomplished by four reactions: conversion of six-membered ring naphthenes to aromatics, dehydro-isomerization of alkyl cyclopentanes to aromatics, isomerization of straight chain or slightly branched paraffins to highly branched paraffins, and desulfurization of naphtha which improves the lead response. The isomerization function of the catalyst for converting low octane paraffins to high octane branched chain paraffins is of great importance in attaining the high yield of high octane reformate.

Conversion of naphthenes to aromatics improves the octane rating only in the case of higher boiling naphthenes. In employing Houdriforming for motor gasoline production it is, therefore, desirable to use only feed stocks which have been fractionated to include the maximum amount of naphthenes in a boiling range in which octane improvements can be obtained.

In Figure I are shown octane-yield relationships for an East Texas type naphtha after Houdriforming under different operating conditions with different catalysts. The specifications of this naphtha are given in Table III. Curve A, Figure I, represents results obtained with a commercial molybdena-alumina hydroforming catalyst and shows how hydrocracking lowers yield without corresponding octane gain. Also a type of hydrocracking occurs with this catalyst which causes catalyst deposit formation and requiring frequent regeneration. Curves B and C were obtained with different Houdriforming catalysts; B has only a dehydrogenation function whereas C has both dehydrogenation and isomerization functions. The differences between these catalysts become most apparent at high octane numbers. It is quite striking also that a 78 volume percent yield of C_{5+} 3 lb. RVP product of 97.3 F-1 clear octane number was obtained with catalyst C.

All yields and octane numbers in Figure I are for C_4-free gasoline of about 3 lbs. RVP. Considerable outside butane may bring the gasoline to 10 lbs. RVP. Overall yield and, to a certain extent, also octane numbers are thereby raised. Catalyst C under proper conditions can produce enough butane to obtain 10 lb. RVP. gasoline. However, catalyst B under all operating conditions and catalyst C under mild conditions give products to which outside butane must be added. Butane produced in Houdriforming and the outside butane required thus compensate for most or all of the volume loss suffered in converting the naphthenes to aromatics. Indeed, as shown in Table IV, the 10 lb. RVP gasoline may amount to 100 volume percent plus of the charge when utilizing added butane.

Since outside butanes are available in most refineries, it is very desirable to eliminate hydrocracking as far as possible. In the event that butanes are required for the production of 10 lb. RVP gasoline, hydrocracking can be effected.

In Table IV are shown yields and octane numbers obtained by Houdriforming East Texas type naphtha (previously described) at three sets of operating conditions. These data illustrate how an increase in severity of operating conditions will raise octane number at expense of yield. At desirable operating conditions the usable catalyst life is principally a function of external poisoning by impurities in the feed stock. With proper control of these no loss in activity has been experienced in pilot plant runs.

TABLE I

Inspection of Base Charge Stock for Aromatic Production

Boiling Range*	150-220° F
Gravity, °API	60.2
Distillation, ASTM	
IBP, °F	162
10%	180
30%	186
50%	190
70%	196
90%	204
Dry Point	215
Composition	
Benzene	1.8
Toluene	4.2
Methyl Cyclopentane	5.1
Cyclohexane	14.3
Dimethyl Cyclopentanes	9.2
Methyl Cyclohexane	22.7
Paraffins	42.7

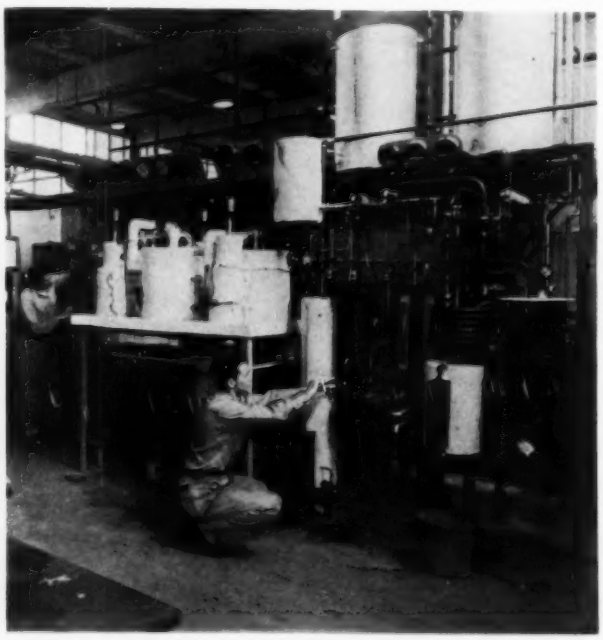
* Temperatures are the cut points during preparation of this stock using a 20 plate distillation column.

TABLE III

Inspection of Charge Stock for Gasoline Production

(East Texas Type Naphtha)

Boiling Range	188-368°F
Gravity, °API	55.3
Distillation, ASTM	
IBP, °F	188
10%	215
30%	232
50%	252
70%	280
90%	317
Dry Point	349
Sulfur, %	0.006
Composition	
Paraffins, Vol. %	44
Olefins, Vol. %	0
Naphthenes, Vol. %	42
Aromatics, Vol. %	14
Octane Number: F-1 Clear	51.2
F-1 + 3 cc. TEL	76.6



Pilot plant employed in developing Houdriforming data.

TABLE II

Houdriforming Operations Processing a 150-220° F. East Texas Type Naphtha for Benzene and Toluene Production

	Order of Increasing Severity		
	1	2	3
Liquid Product C_4-Free, Vol. % of Charge	93.2	92.2	91.5
Aromatics in Liquid Product, Vol. %	38	45	48
Conversion of Naphthenes to Aromatics, %	70	84	90
Unit Off Gas Produced, SCF/Bbl.	1160	1310	1360
Hydrogen Content of Off Gas, Vol. %	98.5	98	97.5

TABLE IV

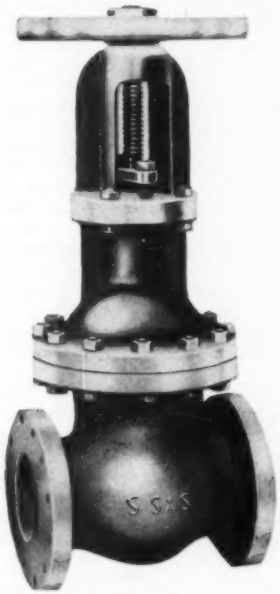
Houdriforming of East Texas Type Naphtha

188-368° F, F-1 Clear 51.2 F-1 + 3 cc. TEL 76.6

	Condition 1	Condition 2	Condition 2
Yield, C_5*, Vol. % of Feed	77.7	88.5	96.0
Wt. % of Feed	82.8	92.7	98.0
C_4, Vol. % of Feed	17.2	6.1	1.2
F-1 Clear, 3 lb. RVP Gaso.	97.3	91	71
F-1 + 3 cc. TEL, 3 lb. RVP Gaso.	Iso-octane + 0.3 cc TEL	98	87
Yield, 10 lb. RVP Gaso. Calc., Vol. %	86*	98**	106***
F-1 Clear, Calc.	98	92.5	75
F-1 + 3 cc. TEL, Calc.	>100	99	89.5

* Excess butane over 10 lb. RVP gasoline is 8.9 vol. %.
** Outside butane required for 10 lb. RVP gasoline is 3.4%.
*** Outside butane required for 10 lb. RVP gasoline is 8.8%.

Valves and Fittings for the Oil and Allied Industries



PRESSURE GAUGES FOR EVERY PURPOSE

WE ARE SPECIALISTS IN THE MANUFACTURE OF:—

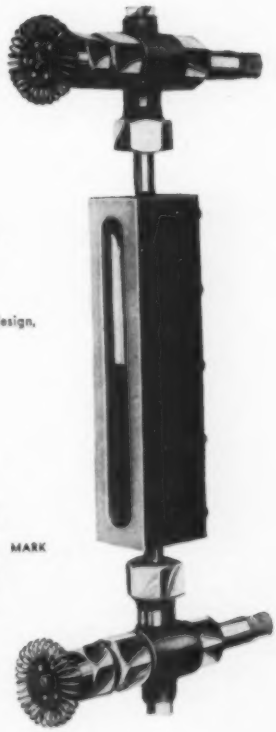
CAST STEEL & FORGED STEEL

WEDGE GATE VALVES
SWING CHECK VALVES
GLOBE AND ANGLE STOP VALVES
SCREW DOWN STOP VALVES
METER VALVES
LIQUID LEVEL GAUGES

All Types of Oil Valves and Fittings for:—

CRACKING PLANT **STORAGE TANKS**
REFINERIES, ETC.

Write now for our BOOKLET SH/Z/A for full details of design, dimensions and specifications.



VALVES READY FOR SHIPMENT

TRADE MARK

SYDNEY SMITH & SONS (NOTTINGHAM) LTD.

BASFORD WORKS, NOTTINGHAM, ENGLAND.

Phone: Nottingham 75031/2 Grams: "Smiths, Nottingham" Code: A.B.C. 5th Edition

LONDON OFFICE:

WHITT & CHAMBERS LTD. Burwood House, Caxton St., London, S.W.1. England

Phone: ABBey 3021 . . Grams: WHITCHAM SOWEST, LONDON

Refining of Shale Oil

By O. W. Willcox

ACCORDING to latest accounts, the final form of the United States Bureau of Mines shale oil project still requires settlement of two technological problems: what type of retort will give the largest yield of crude shale oil at the least expense; and what is the most suitable refining process for the crude oil? At the moment, the engineers at the Rifle, Colorado, demonstration plant of the Bureau of Mines are making up their minds for a choice between four types of retorts.

The first retorts constructed at Rifle were internally fired, batch-type units known as N-T-U retorts, which are simply brick-lined vessels with a manhole at the top for charging the crushed shale and a hinged bottom for discharging the spent shale. A fire is lighted at the top, and a blower creates a draft from above down, so that the zone of combustion proceeds from the top to the bottom, driving before it the products of the thermally decomposed organic matter. The vapors are cooled, and the oil is recovered. The non-volatile carbon that remains on the shale fragments in the retort is burned, so the process provides its own fuel.

Another of the four possible types of retorts is the Bureau of Mines "gas-flow" retort which operates continuously. It is a vertical vessel of rectangular cross section through which previously heated combustion gas is passed horizontally from one side to the opposite side, decomposing downward-moving shale and sweeping the decomposition products to a scrubbing and condensing system. Water is required for cooling.

Independently of the Bureau of Mines, two other types of retorts have been originated by oil companies and show possibilities of becoming important commercially. One of these, the Union Oil Company retort, is a continuous adaptation of the N.T.U retort, being a downdraft, internally fired unit. The fourth one, originated by the Standard Oil Development Company, uses the fluidizing technique which is now extensively used in catalytic oil-cracking processes.

The principal advantage of the three continuous processes of shale retorting are listed as follows: The gas flow process produces fuel gas as a byproduct and obtains a high yield of oil. The Union Oil retort produces low-quality fuel gas as a byproduct and uses cold raw shale to condense the oil vapors, thus requiring no condensing equipment and no cooling water. The Standard Oil Development process uses solid-to-solid heat transfer, produces byproduct fuel gas and presumably will have a high shale throughput.

From the standpoint of the petroleum refiner, the most important differences between shale oil and petroleum are that shale oil contains high percentages of olefins, aromatics and compounds of sulfur, nitrogen and oxygen but low percentages of paraffins and naphthenes as compared to petroleum. The sulfur, nitrogen and oxygen compounds are difficult to remove, and the treating losses in their removal are higher than with petroleum, largely on account of the high percentage of unsaturates in shale oil. As compared with petroleum, shale oil is deficient in hydrogen.

Without any refining whatever, crude shale oil from N-T-U retorts has been used to fire the boilers at the demonstration plant and has been found very satisfactory. By relatively simple refining with conventional equipment, shale oil will yield a range of acceptable fuel oils. The manufacture of motor and diesel fuels, with yields and qualities comparable to petroleum products, is not so simple and requires an approach different from that used with petroleum.

The experimental refinery at Rifle is of the smallest size that could be built, using conventional petroleum refining equipment. After much study a system was evolved comprising a Dubbs single-coil thermal-cracking process and a cold-acid treating unit with a rated capacity of 300 barrels per stream day through the heater. Additional equipment comprises two coke chambers (one as a reaction chamber for recycle cracking operations), a flash fractionator for separating gasoline, light gas oil, heavy gas oil and heavy fuel oil, a side-cut stripper to take light components out of the diesel fraction, an absorber for liquefiable gases, a stabilizer for removing excess of butane and lighter components, a continuous low-temperature, acid-treating unit for removal of nitrogen, sulfur, color and gum from motor fuel, a rerun distillation unit for removal of high-sulfur polymers from the gasoline after acid treatment, and a continuous doctor sweetening unit for gasoline or other distillate fractions. Thus the plant has considerable flexibility: atmospheric distillations, coking, viscosity breaking, single coil recycle cracking, and reforming.

The products are gasoline, diesel fuel, distillate burner fuels, residual fuels, coke and fuel gas. Although simple topping yields only about five percent gasoline, there has been obtained an overall yield of 40 to 50 percent of gasoline by coking and recycle cracking. The motor octane numbers of the raw cracked gasolines range from 62 to 69; after treating and leading (3cc of TEL), the octane numbers were all close to 73 motor method and 80 research. Finished shale oil diesel fuel produced by viscosity-breaking operations had a cetane number of 47 after treating, and in service tests it has performed satisfactorily in heavy dump-trucks and other diesel-powered mining equipment. Preliminary tests show that the light gas oil meets the requirements for a No. 3 fuel oil. The heavy gas oil is a satisfactory stock for thermal cracking, and the residuum can be made to meet specifications for either a No. 5 or a No. 6 fuel oil.

In the refinery recycle cracking of shale oil imposes the most severe conditions of any of the operations with strict requirements on the mechanical design specifications for this operation as regards strength and resistance to corrosion.

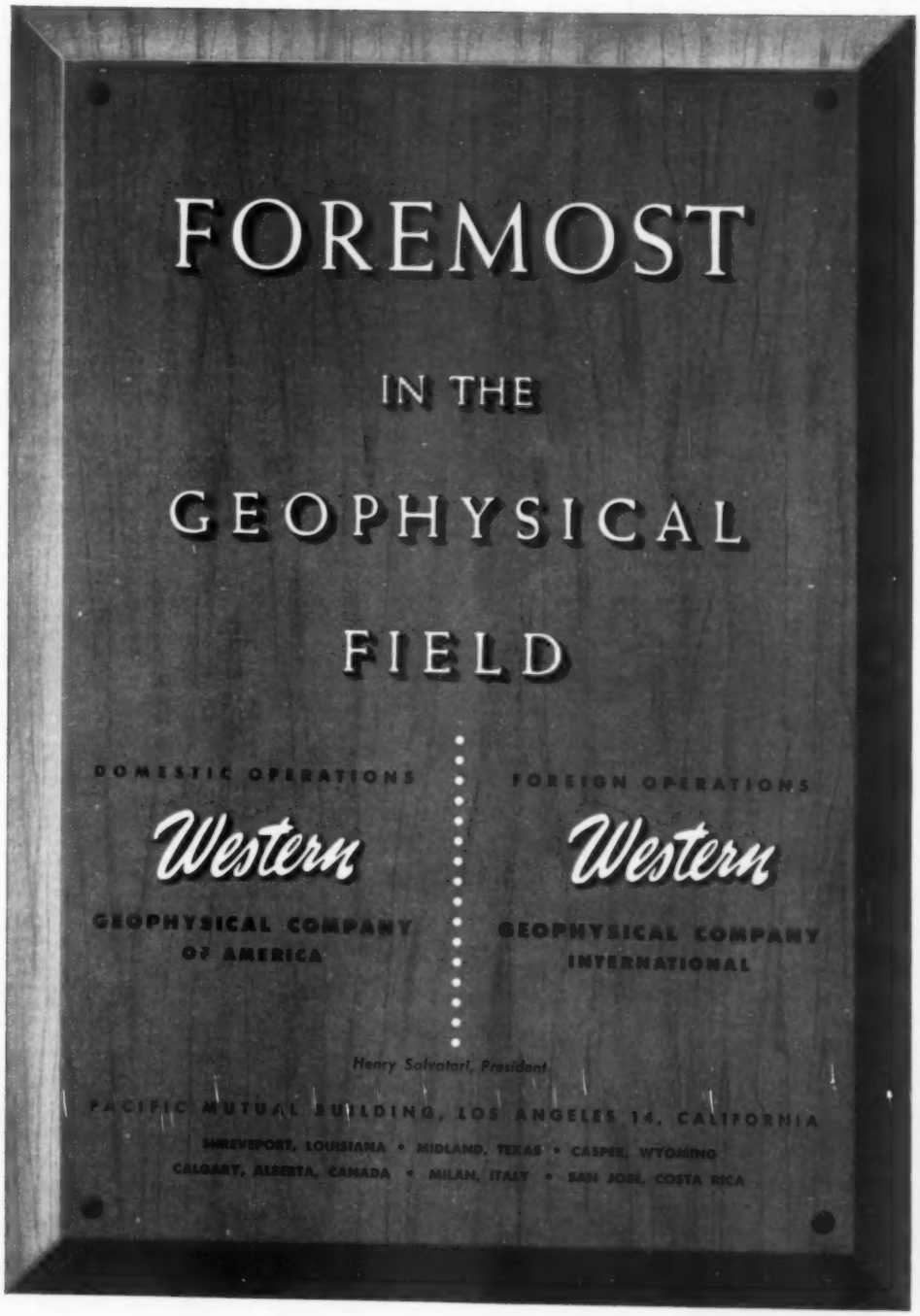
Variants of the refining process have been tried, and at present a study is being made of possible application of hydrogenizing, which in shale-oil projects in various other countries has been found to depress formation of non-volatile hydrocarbons and coke and to increase volatility. Much sulfur and nitrogen are removed by hydrogenizing, thus raising the quality of the raw shale oil.

As regards the question, why has a shale oil industry never been established in the United States, the answer is that the establishment of such an industry is purely a matter of economics. Except for a period during the 1920's, the United States has been able to meet the domestic demands of the country at a price considerably less than the selling price of shale oil could possibly have been. But the situation is changing. Due to the increased difficulty of finding new petroleum, the price of crude has risen sharply during the past few years. This, together with advances being made in the technology of mining and processing oil shale and of refining shale oil, is bringing the cost of liquid fuels from petroleum and liquid fuels from oil shale close to the same level. If present trends continue, it may not be long until shale oil can supplement petroleum at a comparable price.

The engineers at the Rifle demonstration plant have estimated that the cost of producing crude shale oil from 30-gallon-per-ton shale, using the mining technique developed and demonstrated at Rifle and retorting by the gas-flow process, would be about $1.50 a barrel. This includes estimated out-of-pocket operating costs and depreciation but not income taxes or profit. In establishing a depreciation rate, the life of each individual piece of mining equipment was estimated, resulting in an average life of about 7.5 years. Depreciation of plant equipment over a 15-year period was assumed.

To calculate a selling price, it would be necessary to allow enough margin to provide for income taxes and return on investment. Because opinions differ widely as to what the rate of return should be, no figure is quoted as an estimated selling price. However, as an illustration, it is pointed out that if the market dictated a selling price of $2 a barrel, the return on the initial investment, based on the $1.50 cost figure, would be approximately six percent a year after income taxes.

The refining cost of shale oil probably will be somewhat higher than for most petroleums, since shale oil is of a comparatively low refining quality. However, the results achieved in experimental shale-oil refining operations have been encouraging, and it seems reasonable to expect that continued study and experimentation will produce results that will improve the economics of converting crude shale oil to refined liquid fuels. It may be possible to develop a refining method that would use the special properties of shale oil to advantage and, therefore, be better suited for shale-oil processing than the petroleum refining processes of today. Furthermore, the byproducts of a shale-oil industry may have enough value to favor the overall economics of the industry appreciably.


FOREMOST
IN THE
GEOPHYSICAL
FIELD
DOMESTIC OPERATIONS
Western
GEOPHYSICAL COMPANY
OF AMERICA
FOREIGN OPERATIONS
Western
GEOPHYSICAL COMPANY
INTERNATIONAL
Henry Salvatori, President
PACIFIC MUTUAL BUILDING, LOS ANGELES 14, CALIFORNIA
SHREVEPORT, LOUISIANA • MIDLAND, TEXAS • CASPER, WYOMING
CALGARY, ALBERTA, CANADA • MILAN, ITALY • SAN JOSE, COSTA RICA

International news and notes

38 Million Tons German Crude Reserves

According to the latest estimates of the Geological Survey (Amt fuer Bodenforschung), Germany has at present a total of 38,025,000 tons (270 million barrels) crude oil reserves. Of this quantity 27.5 million tons can be regarded as proved, and 10.5 million tons as probable reserves. Compared with the last reserves estimate of the Amt fuer Bodenforschung of March, 1950, there is a total increase of 1.5 million tons. Now 72 percent of the total quantity can be considered as proved, compared with only 60 percent in the past year.

The Emsland with 18.9 million tons proved, and approximately seven million tons probable reserves is at the head of the reserves list. Due to the finds in Eldingen and Hohne the total reserves figure of the Hannover area (10.2 million tons) shows a rise of two million tons compared with the year 1950. The calculations for the oil districts Hamburg-Holstein (1.96 million tons), and Baden (65,000 tons) are also higher than in the previous year.

New Managing Director of Shell-Mex and B.P. Ltd.

C. M. Vignoles, O.B.E., has been appointed managing director of Shell-Mex and B. P. Ltd. in succession to C. M. Merrick, who is retiring. Mr. Vignoles joined the Royal Dutch-Shell Group in 1924 and, in the early part of his career, served in the Far East. In 1932 he was transferred to the fuel oil general department in London. He served as a member of the Overseas Supply Committee of the Petroleum Board until May 1940, when he was seconded to it to undertake full-time executive duties, later becoming joint executive secretary. For his services in this connection he was awarded the O.B.E. in 1946. After the war Mr. Vignoles was appointed eastern area manager of the Shell Petroleum Co. and became a director of Shell-Mex and B. P. Ltd. in November 1950.

Mr. Merrick joined the Asiatic Petroleum Co. (now the Shell Petroleum Co.) in 1924. He gained his early experience of the oil industry in British Malaya, becoming a branch manager in 1928 and general sales manager in the Singapore head office in 1933. Returning home in 1936 he was transferred to Shell-Mex and B. P. Ltd. and was appointed assistant general manager in 1938 and deputy general manager in 1944. Throughout the war he was responsible for that part of the Shell-Mex and B. P. business (principally in lubricants) which was not taken over by the Petroleum Board. In 1945 he was appointed managing director.

C. M. Vignoles, O.B.E.

H. Wilkinson

Awarded Medal of Freedom

H. Wilkinson, C.M.G., president of Asiatic Petroleum Corp. and Shell Caribbean Petroleum Co. was presented with the Medal of Freedom with Bronze Palm by the Secretary of the Air Force, Thomas K. Finletter.

Mr. Wilkinson was the official petroleum representative for the British government in Washington and served as petroleum adviser to the British Joint Staff Mission during World War II. The citation praised his constructive help and guidance in the formulation of plans and policies involving petroleum refining, supply, transportation, and distribution which were reflected in the effectiveness of allied military operations throughout the world. The outstanding executive ability and sincere devotion to the cause of freedom displayed by Mr. Wilkinson reflect the highest credit upon himself and the commonwealth of Great Britain, it concluded.

Oil Company Name Change

Anglo-American Oil Company, Ltd. has changed the company name to Esso Petroleum Company, Ltd. This change brings the company into line with affiliates throughout the world of the Esso organization and associates the company name with its brand. The present board of directors consists of R. A. Carder, chairman and managing director, L. Sinclair, managing director, H. D. Demoulins, W. E. Jenkins, N. F. Myers, H. W. Page, J. L. N. Pollock, R. H. Porters and A. Waterston.

Venezuela Production

Venezuela's production, which averaged just under 1.5 million barrels per day in 1950, was hovering around the 1.7 million barrel mark as the month of April ended. Comparative figures by operators for the months of January and February are given in the accompanying table.

In Western Venezuela, British Controlled's EM-285 was trying to pull 6⅝ inch casing prior to further testing, thought to be around 9,000 feet. Other important tests on the east side of Lake Maracaibo were Texas Company's El Cocal-1, a rank wildcat on the west shore of the Gulf of Venezuela, drilling at about 5,000 feet in late April; Shell's LS-1387, Pueblo Viejo deep test, drilling below 2,000 feet; and the same company's CQ-1, high in the mountains near the village of Valera, drilling below 10,000 feet. Shell has announced a second location, Boqueron BQ-1, about eight miles southwest of CQ-1, to be drilled on the completion of that hole. Shell is now moving in on a location tentatively known as Quiroz, 22 miles due south of BCO's El Mene de Mauroa field, where the first of a possible three locations will be drilled soon after May 1, Creole and Mene Grande will participate in this testing of an area where one or two dry holes were drilled many years ago. On its own, Creole will soon spud La Polonias-1, an 8,000 foot newfield test near and southeast of La Vela de Coro, at the base of the Paraguana Peninsula. Shell's Cretaceous tests C-149, in the Concepcion field, and San Ignacio C-150, northeast from Concepcion, were drilling ahead below 6,000 and 5,000 feet, and second test of the Canadones structure was begun in early April with the spudding of Shell's DMC-2.

In Guarico, Atlantic discovered a new small field west from the Tucupido-Taman field, to be called "Monal." The discovery was made in the course of a program of drilling some ten or fifteen slim holes for geological information. MGX-6, the discovery hole, is now called Monal-2, and Monal-3, is already drilling.

The Texas-Mercedes combine continues to pursue a vigorous exploratory program, with Valle 9-2, five miles west from Monal, drilling at about 4,000 feet. For the near future they have scheduled Dakoa 8-1 as a test of acreage southwest from Monal, and Valle 17-1, an outpost half a mile northwest of Atlantic's Ruiz field. Venezuelan Atlantic completed TUX-9, near Tucupido, as a gasser, and abandoned Anibal-1, rank wildcat in southeast Guarico, but immediately spudded Anibal-2, at a point 700 meters away.

In Eastern Venezuela, Creole was drilling at about 3,500 feet in Guanoco-1, four miles southwest from the famous old asphalt lake, and were sidetracking below 7,000 feet in PCA-17 in the Delta Amacuro. Pantepec were going on down with Roble RPN-27, near 10,000 feet. Phillips completed Laloma-2, almost a year after spudding and started on Laloma-3.

Following the successful completion of Guere-3 for over 300 B/D, Sinclair spudded Guere-4, drilling at about 3,000 at the beginning of May. Sinclair also had a wildcat drilling at 2,000 feet in Guarico, eight miles north of the Tucupido field, Piedra Azul-1. Socony continued to drill ahead on Guario-30A, a new-pool test in the San Joaquin area. Texas's Mata-2, northeast of the Greater Oficina area, was nearing 11,000 feet. Meñe Grande completed 6-M-5 in the Marad district of Western Venezuela for over 7,000 barrels, and was drilling ahead on the Eastern Venezuela wildcats East Soto-1 (11,000 feet), Divi-1 (3,000 feet) and Chaparro-1 (8,500 feet).

	January 1951			*February 1951*		
Company	*Western Venezuela*	*Eastern Venezuela*	*Total*	*Western Venezuela*	*Eastern Venezuela*	*Total*
Creole	557,073	145,120	702,193	556,930	144,112	701,042
Shell Co.'s	504,804	.....	504,804	509,723	.....	509,723
Mene Grande	60,862	212,849	273,711	55,918	217,548	273,466
Texas-Mercedes	15,370	31,845	47,215	14,918	32,633	47,551
Socony	.....	46,765	46,765	.....	45,113	45,113
Atlantic	15	19,933	19,948	.....	20,350	20,350
Sinclair	.....	11,263	11,263	.....	11,309	11,309
Pantepec	.....	10,793	10,793	.....	10,409	10,409
Richmond	10,447	.....	10,447	10,278	.....	10,278
Phillips	.....	6,347	6,347	.....	5,693	5,693
BCO, Ltd.	914	.....	914	967	.....	967
	1,149,485	484,915	1,634,400	1,148,734	487,167	1,635,901

BUILDING STRENGTH FOR THE FREE WORLD

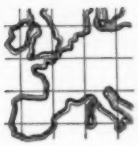
Highlights from the Annual Report of Standard Oil Company (New Jersey) for 1950... a year of record activity*

Standard Oil Company (New Jersey) is an American corporation which has, in varying degrees, investments of capital and technical knowledge in a large number of operating oil companies, both in the United States and abroad. In 1950, these companies:

IN THE U. S. A.

Drilled over a thousand new wells, with an unusually high proportion of producers . . .
Improved and expanded refineries in New Jersey, Maryland, Louisiana, and Texas . . .
Completed a new continuous wax-making plant at Bayonne, N. J. . . .
Added 370 miles to Texas crude oil pipeline systems . . .
Started doubling the capacity of a products pipeline across Pennsylvania . . .
Let contracts to increase by 85% the capacity of a pipeline from Baton Rouge to the Southeastern states . . .
At government request, re-activated two government-owned Butyl rubber plants; also continued operating two others which have been producing constantly since 1943 . . .
Invested over 20 million dollars in laboratory research for new and improved processes and products.

IN WESTERN EUROPE



Proposed a plan which ended gasoline rationing in England . . .
Went ahead of schedule in construction of a new refinery at Fawley, England, to be the largest in Europe . . .
Expanded, improved or started construction of refineries in Norway, Belgium, West Germany, France, and Italy . . .
Opened many new service stations, which served not only local motorists, but some 18,000 American tourists . . .
Supplied 28% more fuel oil than a year ago, to meet needs for industrial expansion . . .
Met the greatest demand for asphalt for new road building ever experienced in these areas.

IN THE MIDDLE EAST

Stepped up oil production substantially in Saudi Arabia . . .
Opened the vitally important Trans-Arabian Pipeline system from oil fields on the Persian Gulf to the Mediterranean . . . over 1,000 miles of 30- and 31-inch pipe . . .
Started construction of a large-diameter pipeline extending 550 miles from Iraq to the Mediterranean.

IN THE FAR EAST

Expanded production of crude oil in Indonesia and explored for oil in Papua . . .
Increased output of refineries in Australia, Sumatra, Japan.

IN CANADA

Produced nearly 50% more oil than a year ago . . .
Made new oil and gas discoveries in Ontario and Alberta . . .
Operated nine refineries at 14% greater output than a year ago . . .
Opened a new 1,100-mile pipeline system from Alberta to Lake Superior, to carry crude oil toward the major Canadian refineries and markets.

IN SOUTH AMERICA

Set a new production record in Venezuela, second largest oil-producing country in the world . . .
Operated the big Aruba refinery in the Netherlands West Indies at a higher rate than ever before . . .
Met sharply increased call for products throughout the continent, to support the vigorous post-war development.

IN OCEAN TRANSPORT

Received the last 4 of 12 super-tankers ordered two years ago . . .
Ordered 6 more new tankers . . .
Operated an ocean-going tanker fleet of 117 vessels, totaling over 2 million deadweight tons.

IN EMPLOYEE RELATIONS

Continued the same favorable labor relationships that have prevailed for more than three decades, with no strikes in domestic operations.

THE YEAR ENDED . . . THE JOB GOES ON. In 1950, for the first time, world use of oil outside the Iron Curtain passed 10 million barrels a day. For comparison, it was just over 7 million in 1945, the peak war year.

This is significant to free people everywhere. Oil supplies in today's world are closely linked to living standards and national strength.

It seems clear that more and more the world will look to oil to help keep it free and progressive. More and more it becomes clear, in meeting that need, that the American-developed business process of risk and result . . . of competition spurring corporate ingenuity and responsibility . . . is a strong and flexible system for promoting the welfare of people.

* We will be pleased to send a copy of the full report to anyone wishing it. Write Room 1626, 30 Rockefeller Plaza, New York 20, N. Y.

FINANCIAL SUMMARY

Standard Oil Company (New Jersey) and Consolidated Affiliates

Total income from sales, services, dividends and interest	$3,198,266,000
Net income	$408,223,000
	or $13.48 per share
Dividends	$151,028,000
	or $5.00 per share
Taxes paid	$276,000,000
Taxes collected for governments	$294,749,000
Wages and other employment costs	$548,205,000
Spent for new plants and facilities	$295,132,000
Number of stockholder-owners	222,000
Number of employees	116,000

STANDARD OIL COMPANY (NEW JERSEY)
AND AFFILIATED COMPANIES

Alberta Gas To Enter Montana

First export of Alberta's natural gas on a major scale has been authorized. The announcement was made by Premier E. C. Manning of the Alberta government near the end of March. A special bill to approve the action is expected to pass the legislature without delay.

Decision was reached after requests had been received from both the Canadian and United States governments. The gas is to be used for the operations of the Anaconda Copper Mining Co. and the American Smelting and Refining Co. in Montana. A maximum flow limited to 40 million cubic feet per day is to go from the joint holdings of the McColl-Frontenac Oil Co., Ltd. and the Union Oil Co. of California to the Montana companies.

Supply sources are the Pakowki Lake gas fields immediately north of the Montana border and about 40 miles south of Medicine Hat. The area at the nearest point is 170 miles southeast of Calgary.

The permit has been described by Premier Manning as purely a defense measure, and not to be confused with gas exports for any other purpose. The term of the agreement is to cover five years after which the situation is to be reviewed. The mining and refining operations of the companies involved supply 97 percent of the manganese, 25 percent of the zinc and 18 percent of the copper produced in the United States.

The main transmission line to Montana will be 16 inches in diameter. Gathering lines within the fields will range from four to eight inches in diameter.

The 1951 drilling program of the Department of National Defense of Canada, in the Suffield gas area of south-east Alberta, about 140 miles south-east of Calgary, covers a five well project, the first of which is completed. The field was developed in World War II to supply fuel for the Suffield experimental testing station. In 1950, 10 wells were completed in this area. The object at present is to create a greater supply of gas for military requirements.

Steel for Mexican Gas Line

Steel for construction of Mexico's proposed 700-kilometer (300-mile), 20 inch Brazil-Poza Rica gas pipe line starting early in 1952, has been guaranteed by the Kaiser west coast steel mills according to Pemex officials. The new line will deliver gas from northern fields, by way to Tampico, to intermediary cities and will also be employed to re-pressure wells in Poza Rica. By this plan Mexican engineers hope to raise Poza Rica's output from 100,000 barrels daily to 220,000 barrels.

Mexico Orders Lube Plant

The Arthur G. McKee & Co., of Cleveland, has signed a contract with Petroleos Mexicanos to construct a $15,300,000 lubricant plant at the Antonio M. Armor Refinery of Pemex at Salamanca, in the State of Guanajuato, it was announced in Mexico City by Pemex officials. The statement said the plant's production "will be able to fill market needs for lubricants and greases, thereby avoiding the present outflow of dollars for these imported products." Pemex is currently importing over six million barrels of lubricants annually at a cost calculated at around $25,000,000.

New Johnson & Phillips Director

Arthur Clifford Hartley has been appointed to the board of directors of Johnson & Phillips Ltd., electrical engineers and cable makers. Mr. Hartley, who is president of The Institution of Mechanical Engineers joined the Anglo-Iranian (then Anglo-Persian) Oil Co., Ltd. in 1924. He went to Persia in 1926, and again in 1931 to deputize for the assistant general manager (technical), and when in London undertook the duties of chief engineer. He was seconded to the Iraq Petroleum Co., Ltd. from 1932 to 1934 for the design and development of the Kirkuk to Mediterranean desert oil pipelines. He then returned to the Anglo-Iranian Oil Co. Ltd. and held the position of chief engineer until Dec. 31, 1950, when he relinquished it to become consultant to the company as from Jan. 1, 1951.

Left to Right: T. W. Mathias, A. Hyman, A. R. deBeer

Mathias Succeeds Hyman

T. W. Mathias has been appointed general operations manager of Shell-Mex and B. P. Ltd. in place of A. Hyman, who has retired. Mr. Mathias joined the previous Shell-Mex Ltd. in 1922 as a chemist at the company's central laboratories, then at Shell Haven. He was later transferred to the sales department. In 1935 he was appointed sales manager of Colas Products Ltd. and became managing director of that company in 1941. In 1948 Mr. Mathias became manager of the bitumen department of Shell-Mex and B. P. Ltd.

A. R. de Beer has been appointed manager of the bitumen department of Shell-Mex and B. P. Ltd., in which capacity he will be assisted by A. W. Jarman as assistant manager. Mr. de Beer has had 28 years' service with the company and its predecessor, Shell-Mex Ltd. During the war he was secretary of the bitumen pool of the Petroleum Board.

Mr. Hyman joined the development department of Shell-Mex Ltd. in 1924, and was appointed manager in 1937. On the formation of the Petroleum Board in 1939, he became manager of inland distribution department, where his flair for improvisation under the stress of war conditions proved invaluable. In 1947, he was appointed assistant general manager of Shell-Mex and B. P. Ltd.

New Pemex Contracts Forecast

Petroleos Mexicanos is expected to sign a new series of percentage-of-production drilling contracts with U. S. oil companies before the end of July. Under the standard-type contract offered private American investors, drillers must pay all their expenses but are entitled to 15 percent of the production (18 percent in tidelands areas) plus 50 percent until costs are covered.

Among the companies reported considering opening negotiations with Pemex for such contracts are the Sinclair Oil Corp., Parker Production Co., Ltd., of Canada, and an unidentified new group of investors represented by Bart Gillespie, former manager of Cima, pioneer foreign company to drill in Mexico on a percentage-of-production basis.

G. P. Parker & Sons, of Wichita, Kansas, recently sent two executives to Mexico City to sound out possibilities for a contract for its Canadian operation, Parker Production Co., Ltd. One of these representatives, A. L. Johnson, told WORLD PETROLEUM his company is "definitely interested in several close-to-home foreign operations."

At the same time, high Mexican sources said that Sinclair, which has kept up a "working friendship" with Pemex ever since the 1938 expropriation, will soon open percentage-of-production contract talks with the Mexican government oil agency. The same sources disclosed Gillespie is already carrying on conversations with Pemex on behalf of a group of investors not connected with Cima, his former association.

Other attempts of private U. S. companies to secure similar contracts are reported to be at a standstill. Southeastern de Mexico, Mexican operations of the Southeastern Oil Co. of Jacksonville, Florida, has reported there are "no new developments" in its drawn-out discussions on this subject.

A contract that may set a new pace for Mexican drilling is that being arranged by a group of Northwestern U. S. oil men represented by Ralph Cake, Portland, Ore., attorney. His chief sponsor is said to be Francis Alstock, who is considered in Mexico as "one of this country's best friends in the United States" by many top Mexican officials.

A surprise in the Mexican drilling picture was the announcement by George Calleya, manager of the Mexican-American Independent Oil Co., that Cima, the company's Mexican operation, will drill two locations immediately. Since this company was recently reported about to be liquidated the announcement stirred speculation that Petrofina, Belgian firm which has a $1,000,000 interest in the operation, may have come through with additional funds needed to carry on the enterprise.

Mr. Calleya, a former Petrofina executive, announced the company had ordered two Kerr-McGee rigs moved to new drilling sites after they had been idle almost two months. The National 50 rig is being shifted to Rabon Grande, in the State of Veracruz, where spudding-in is expected to take place in the near future. The National 75 rig will be sent to Pisomicicocan, in the State of Tabasco, where drilling should start in about six weeks. Preliminery clearing, as well as road and bridge construction, at the locations is already underway, Calleya indicated.

The Cima manager also disclosed a number of new appointments to fill holes in his company's staff left by the recent wave of resignations among U. S. personnel. Hugh Scala, a field geologist, has been promoted to chief geologist; Mike Bush will continue as general drilling superintendent, and Keith Wood has been named field geologist in charge of both the new locations.

Mexican exports in March were 300,000 barrels lower than in April totaling 1,248,800 barrels of crude and 394,400 barrels of fuel oil. Sinclair was the largest buyer taking 978,300 barrels. Eastern States took 449,500 barrels. Pemex has found it necessary to cancel contracts for aviation gasoline with some domestic and foreign airlines operating in Mexico because demand has exceeded current supply.

Oil Refineries for Brazil

Refinaria e Exploracao de Petroleo Uniao (Soares Sampaio group) has signed a contract with Hydrocarbon Research Inc. for the supply and installation of a 20,000 barrel refinery at Capuaya, in the San Paulo Municipality of Santo Andre. The plant will include a TCC catalytic unit and will process imported crude, which will be landed at Santos and conveyed by pipe line to Santo Andre. It is to begin operating within 22 months.

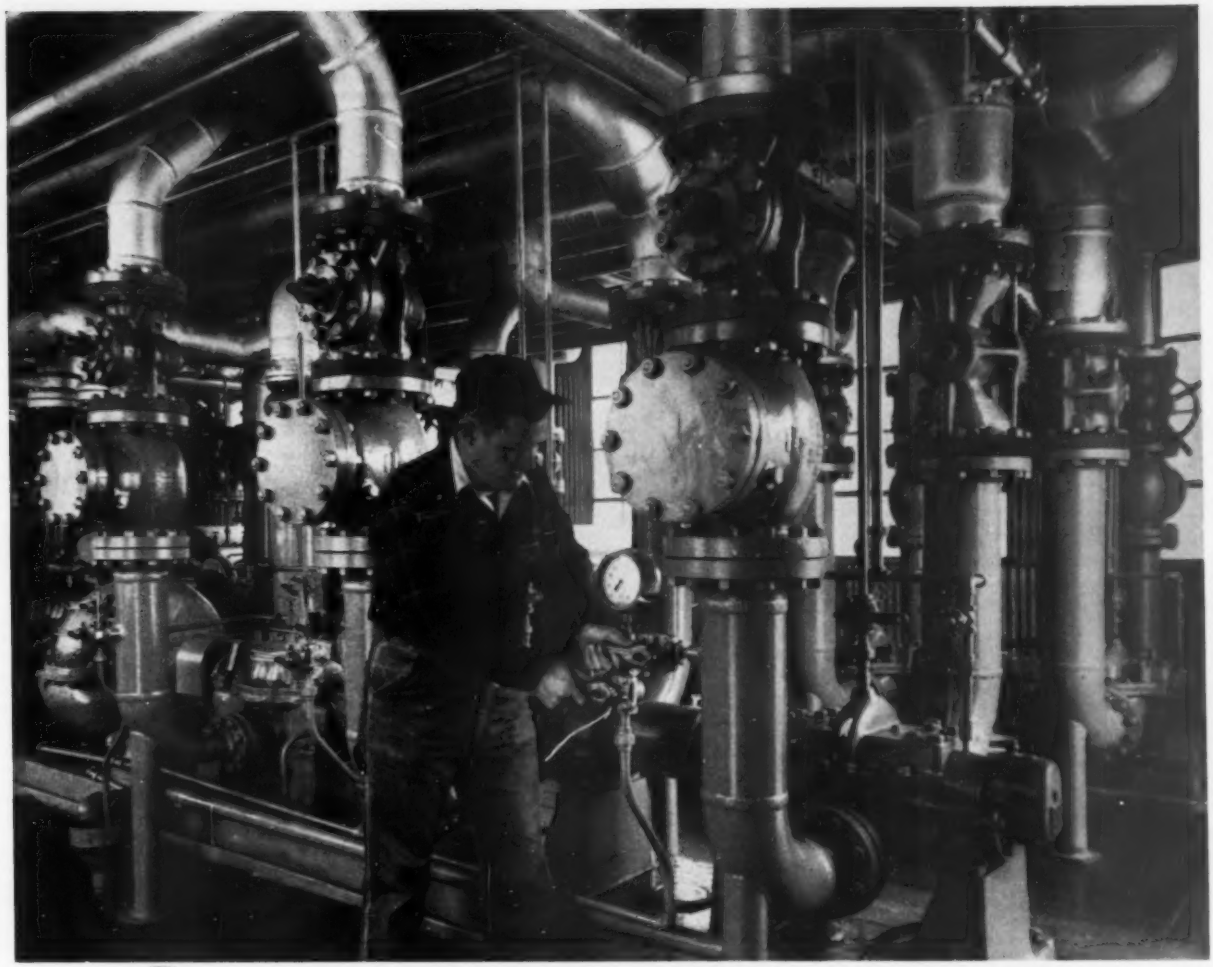
The company was formed in 1946 and its concession to refine was approved by the National Security Council in November 1949. It was originally intended to acquire the plant in Czechoslovakia, but difficulties arose regarding exchange cover, and under the present scheme all equipment will be purchased in the United States. The company's initial capital of U. S. $3,300,000 is to be raised to U. S. $16,500,000, 50 per cent of the new shares being offered to the public.

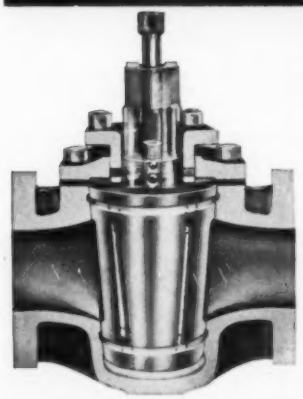
In March the Refinaria de Petroleo do Distrito Federal (Drault Ernani group) signed a contract with the M. W. Kellogg Co. for the construction and installation of a 10,000 barrel refinery at Manguinhos, Rio de Janeiro. The plant is to be delivered within 15 months.

The present Brazilian government's clearly expressed desire to solve Brazil's petroleum problem, by offering adequate guarantees to foreign capital while retaining state control, is meeting with a favorable response. Official discussions of a project to form a company with mixed United States and local capital were interrupted by the change of governments, but have now been resumed in a cordian atmosphere. Both sides seem prepared to make concessions.

Joins Shaw-Petrie

Kenneth Morrison, until recently general manager of Messrs. Penman & Co. Ltd., Caledonian Boiler Works, Glasgow, has taken up the appointment of technical manager with Messrs. Shaw-Petrie Ltd., pipework contractors of Hillington, Glasgow and London. Mr. Morrison will be responsible for the design, drawing office and estimating work, and also for the technical supervision of the production.



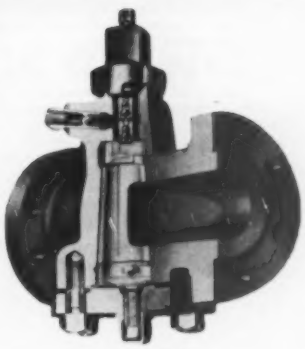


Standard

Audco-Nordstrom's
belong in your pump house

Insure most dependable operation in controlling flow of all liquids, chemicals, gases, hydrocarbons, slurries and solutions—hot or cold—at any pressure

KEEP UPKEEP DOWN



Hypreseal

BRITISH

Audco-Nordstrom

AMERICAN

LUBRICATED VALVES

ROCKWELL MANUFACTURING COMPANY
400 N. Lexington Ave., Pittsburgh 8, Pa.

Export: International Division, Rockwell Manufacturing Co., 7701 Empire State Bldg., New York 1, N.Y. Canadian Licensees: Peacock Bros., Montreal, Quebec.

AUDLEY ENGINEERING COMPANY, LTD.
Newport, Shropshire, England

Overseas Agents located in South Africa, Australia, India, Trinidad, British West Africa, Finland, Norway, Sweden, France, Belgium, Switzerland, Italy, Roumania, Spain and Portugal.

Oil company staff changes

Lloyd W. Elliott

LLOYD W. ELLIOTT will resign as president of Standard Vacuum Oil Co. to become a director of the Standard Oil Co. (N.J.). Mr. Elliott has been president of Standard-Vacuum since 1946. He joined The Carter Oil Co. in Tulsa in 1916; after military service in France in World War I he returned to Carter and later was associated with a Jersey affiliate in Mexico. In 1929, he was made general manager of Nederlandsche Koloniale Petroleum Maatschappij (NKPM), a Jersey affiliate operating in the Netherlands East Indies, now Indonesia. The NKPM company was one of the companies, included in the formation in 1933 of Standard-Vacuum.

Mr. Elliott remained in the Indies until the Japanese invaded that area in 1942. After eluding capture by the Japanese and reaching Australia, he was commissioned in the U. S. Army and served with the Southwest Pacific forces in Australia, New Guinea and the Philippines as chief petroleum officer. When he left the service he held the rank of Colonel. Later he was advanced by the President to the rank of Brigadier General in the Officers Reserve. For his military service he received the U. S. Distinguished Service Medal and he also was decorated by the Netherlands Government.

IRVING J. STAID has been appointed manager of the manufacturing department of Carter Oil Co. with headquarters at Billings, Mont. He succeeds T. R. Corbett who became managing director of Esso Standard Refinery, S. A. of Belgium. Herman G. Gunter, superintendent of the Billings refinery, has been promoted to assistant manager of manufacturing, Mr. Staid's former position.

Mr. Staid came to Carter in 1945 as chief engineer of the old Billings refinery. In 1946 he was made assistant manager of the refinery and in 1948 he became assistant manager of the manufacturing department. He participated actively in the preliminary work, the planning and the design of the modern refinery Carter now operates at Billings.

SAM H. CASEY, assistant to the executive vice president, has been elected a director of the Pan-Am Southern Corp. Mr. Casey joined Pan-Am in July, 1948, when he was made manager of the crude oil purchasing department. Prior to that time he was with Sohio Petroleum Co.

FRANK C. OSMENT is the new division geologist for Standard Oil and Gas Company's Texas-Louisiana Gulf Coast division. He was formerly district geologist at Shreveport, La. Mr. Osment succeeds Russell A. Weingartner, who was transferred to Tulsa general offices as senior staff geologist.

Robert J. Hull

ROBERT J. HULL has been made coordinator of marketing of Cities Service Co. at New York. Mr. Hull served in various petroleum sales capacities of Cities Service companies since 1923. He has been sales manager of the Cities Service Oil Co. (Pa.).

ROBERT L. KIDD, vice president and manager of the land and geological division of Cities Service Oil Co., Bartlesville, Okla., has been appointed assistant to President A. W. Ambrose. In addition to his new duties, Kidd will continue his work on oil exploration and development. Mr. Kidd is also a director of the company and has been with Cities Service more than 25 years. He is a member of the American Association of Petroleum Geologists, the Society of Exploration Geophysicists, the American Petroleum Institute and the Tulsa Geological Society. Mr. Kidd's successor as head of the land and geological division is Reese H. Tucker who has been chief geologist since 1949.

SANFORD M. WAGNER, vice president in charge of sales for Ethyl Corp. recently celebrated the completion of 35 years of service to the oil industry. He has been with Ethyl for 25 years and previously spent ten years with what is now Esso Standard Oil Co. Mr. Wagner joined Ethyl soon after it was organized to assist in the installation of mixing plants at oil refineries. In 1945 he was named western regional manager, a post he held until his election as a vice president in January 1950.

Sanford M. Wagner

LESLIE MOSES, division attorney for Midstates Oil Corp., Shreveport, La., has resigned May 15 to move to Houston. He has been appointed executive assistant to the manager of the land, lease and exploration department of Crown Central Petroleum Corp. there. Mr. Moses joined Fohs Oil Co. in Houston in 1936 when the company was merged with Texas Gulf Producing Co. In 1946, he moved to Shreveport to join Midstates.

He has been actively engaged in legal, executive and administrative phases of the oil business for the past fifteen years, and has been a constant contributor to law reviews and oil trade magazines of highly specialized articles on oil and gas law. Several of his monographs have appeared in WORLD PETROLEUM.

SAMUEL B. ECKERT, for many years vice president in charge of marketing, Sun Oil Co., and for the last year executive vice president, has retired after 43 years active service with the company. He continues, however, as a director. Samuel M. Gladney of Dallas, has been elected assistant secretary of Sun Oil Co. He has been with Sun 32 years and is assistant manager of the company's southwest production division.

DR. HERMAN PINES, a research coordinator with Universal Oil Products Co., Chicago, has been appointed associate professor of chemistry at Northwestern University. Dr. Pines is also associate director of the Ipatieff High Pressure Catalytic Laboratory at Northwestern, where he has served since 1941.

EDWARD E. DOORN recently joined the staff of Universal Oil Products Co., Chicago, as traffic manager. He has been engaged in various capacities in that field for the past 25 years. He came to Universal from the central district traffic department of Sinclair Refining Co. at Chicago.

FRANCIS J. HENRY, president, Atlas Lubricant Corp., New Orleans, is making an extensive trip through Holland, Belgium, France, England and Scotland. He will return to the United States at the end of July.

JOHN W. BRICE has been elected chairman of The Carter Oil Co. and will move to Tulsa to assume his new duties. He has been a director of The Standard Oil Co. (N. J.) but was not a candidate for reelection this year because of the Carter election. Mr. Brice has worked for New Jersey Standard companies since 1927. He spent eight years in Venezuela as vice president and director of the Jersey affiliate in that country. He spent three years previously with Carter as vice president and director in charge of exploration.

John W. Brice

Yours the problem - Harveys the answer!

Harvey

G.A. Harvey & Co. (London) Ltd. Woolwich Road, London, S.E.7

Dr. Walter J. Podbielniak

Dr. Podbielniak Wins Hanlon Award

The Hanlon Award, highest honor in the natural gasoline industry was conferred on Walter J. Podbielniak, president of Podbielniak, Inc., Chicago, at the 30th annual convention of the Natural Gasoline Association of America at Tulsa. The award was in recognition of the part which Dr. Podbielniak played in the early development of practical analytical apparatus and his continuous efforts through the years to improve its accuracy and efficiency until it has become the most valuable single tool in the analysis of gas and liquid hydrocarbons.

CHARLES E. SPAHR has been elected a vice president of The Standard Oil Co. (Ohio). He had been manager of the transportation department and will continue in charge of this department as a vice president. Mr. Spahr has been with Sohio since 1939, except for a period of service during World War II, and has worked in an engineering capacity on various transportation projects. In November of 1945 he was named industrial relations assistant in the transportation department of Sohio and in the spring of 1946 became assistant to Mr. Elliott, then in charge of Sohio's transportation department.

DR. PAUL D. FOOTE, vice president of Gulf Oil Corp. in charge of research and development was presented with the Outstanding Achievement Medal Award of the University of Minnesota at Minneapolis. The honor is reserved for former students who have attained high eminence and distinction. It was conferred as part of the University's centennial observances during the dedication of new social science and liberal arts buildings. Dr. Foote has played a leading role in developing the Gulf laboratories at Harmarville, Pa., into one of the nation's major industrial research centers. He has distinguished himself also by extensive contributions to government scientific projects.

Dr. Paul D. Foote

LYLE R. DUTY has been named assistant to the executive vice president and Carl W. Peters has been appointed manager of economics in the Pan-Am Southern Corporation's general office, it was announced recently by Roy J. Diwoky, executive vice president.

Mr. Duty was with Standard Oil Co. (Ind.) for 22 years before coming with Pan-Am Southern. His last assignment was as special representative of the comptroller of that company.

Mr. Peters formerly held a supervisory and administrative position in the research department of Standard Oil Co. (Ind.) at Whiting, Ind. He graduated from the University of Virginia in 1941 with a bachelor's degree in chemical engineering and from Princeton University in 1942 doing exploratory economic studies of refinery operations and refinery planning.

JOHN H. PURNELL who recently resigned as editor of the Examiner-Enterprise, Bartlesville newspaper, has been appointed director of publications and news for Cities Service Oil Co. (Del.). Prior to coming to Bartlesville, Mr. Purnell had served as editor of Texas newspapers and engaged in public relations work.

K. S. Adams, (right), president of Phillips Petroleum Co. since 1938, has been elected chairman of the board and chief executive officer and chairman of the executive committee. The action was taken April 24 by the board of directors at a meeting held after the company's annual meeting of stockholders in Bartlesville, Okla. The position of chairman has been vacant since the retirement in 1948 of the late Frank Phillips, founder of the company. Paul Endacott (left) was elected president. Endacott, as executive vice president and assistant to the president, has been the operating manager of the company and will continue in the same capacity as president.

MARK OLSON has resigned as international editor of **World Oil** to become general manager of operations for C. J. Brown, independent oil operator at Houston. Mr. Olson has worked as a roustabout, drilling engineer and district engineer in the midcontinent and rocky mountain fields.

P. W. PARKER, chairman of Standard-Vacuum Oil Co. will continue as that company's chief executive following the expected resignation of L. W. Elliott, Stanvac's president to become a director of Standard Oil Co. (N.J.). Mr. Parker has been the chief executive of the Stanvac organization since 1946 and has been an officer and director of the company since it was formed. It is planned that Mr. Parker will become president of Standard-Vacuum.

LENNOX A. FITCH has accepted the position of assistant manager of land department of the Pan-Am Southern Corp. and will be located in the company offices at Shreveport, La., according to announcement by M. C. Hoffman, vice president. Mr. Fitch has recently resigned his position of South Louisiana district landman with the Sohio Petroleum Co. of Lafayette, La.

WILLIAM R. SEUREN, formerly assistant to W. J. Carthaus, vice president in charge of Deep Rock Oil Corporation's manufacturing and research division, has been named supervisor of lubricating oil finishing at the company's Cushing, Okla., refinery. Donald T. Axon will succeed him.

C. S. Davis

Heads New Catalyst Plant

C. S. Davis has been appointed plant manager of American Cyanamid Company's new petroleum cracking catalyst plant at Michigan City, Ind., it was announced by C. E. Bonnet, production manager of Cyanamid's Industrial Chemicals Division. The new plant is scheduled to go into operation in June, 1951. For the past two years, Mr. Davis has been general superintendent of the company's plant in Marietta, Ohio, where dyestuffs and intermediaries for pharmaceuticals are manufactured.

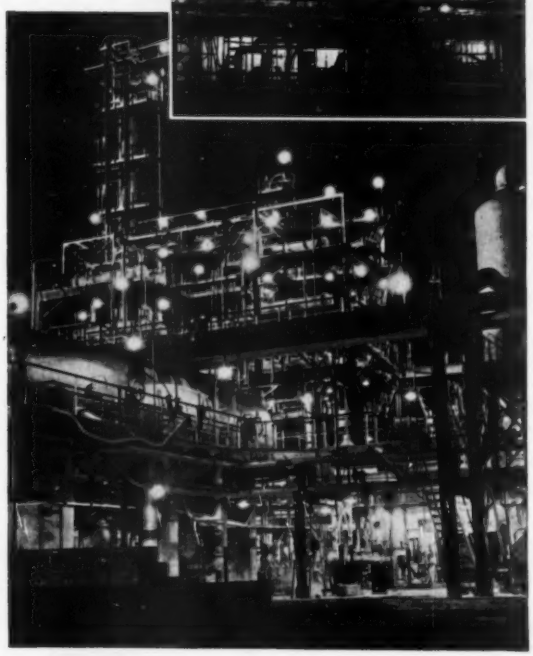
The new Michigan City plant will be concerned mainly with the manufacture of microspheroidal type cracking catalysts. The production of this type of catalyst was pioneered by Cyanamid after intensive research and cooperation with leading firms of the petroleum industry.

T. R. CORBETT of Billings has accepted the position of managing director for Esso Standard Refinery, S. A. of Belgium. This company is commencing the construction of a new refinery at Antwerp, Belgium, and is an affiliate of the Standard Oil Co. (N. J.). Mr. Corbett will assume his new duties on April 1. He and his family will take up residence in Antwerp about June 1. Mr. Corbett has been manager of the manufacturing department for The Carter Oil Co. since December, 1948.

G. GORDON BIGGAR, assistant manager of public relations for Shell Oil Co. was elected president of the Industrial Auto-Visual Association at its annual meeting recently held in Chicago. Daniel Rockford, Standard Oil Co. (N.J.) was elected vice president. Mr. Biggar is a charter member of the association and has served both as eastern district director and vice president. He joined Shell in 1926 and was assigned to the public relations department when it was organized in 1941.

G. Gordon Biggar

Non-Stop Operations



Illuminating the desert for miles around are the bright lights of Anglo-Iranian's major Middle East refinery at Abadan, largest in the world. Anglo-Iranian has refineries in eight other countries, including three in the United Kingdom, four on the continent of Europe and one in Australia. A large new refinery in England is also under construction.

Operating night and day, the processing by Anglo-Iranian of crude oil into quality products for the world's markets goes on unceasingly. Here is the night shift's view of an Alkylation Plant and (inset above) a Distillation Unit.

First and Biggest

oil producers in the Middle East since 1912, Anglo-Iranian Oil Company and its associated companies also operate twelve refineries in Europe, Middle East and Australia; their sales organisation includes major marketing or supply interests in Europe, Asia, Africa and Australasia, with international ships' bunkering and aviation services.

BP

This shield is the symbol of
the world-wide organisation of

ANGLO-IRANIAN OIL
COMPANY, LIMITED

Britannic House, Finsbury Circus, London, E.C.2.

REPRESENTATIVE IN U.S.A.
W. D. HEATH EVES, 610 Fifth Avenue, New York 20, N.Y.

A. E. DIETERT has been appointed division geologist for Cities Service Oil Co. (Del.) at Ft. Worth. He will be succeeded at Bartlesville, Okla., by Mr. Norman W. Ewbank. Mr. Dietert has been engaged in scouting, seismic, geophysical and geological phases of exploration since 1929.

VERNON TAYLOR, formerly operations manager of the producing department of Imperial Oil Ltd., Toronto, has become management assistant at Calgary. He joined the Royalite Oil Co. Ltd., in 1937 and later transferred to Imperial at Calgary as operations manager of the western producing division. In 1948 he moved to Toronto, as operations manager. He is succeeded in that position by E. D. Wilson, formerly division petroleum engineer at Calgary, who served in the Middle East and India in the Royal Canadian Air Force.

GEORGE G. OBERFELL, retired vice president of Phillips Petroleum Co., Bartlesville, Okla., was honored with the Distinguished Service Award of the Liquefied Petroleum Gas Association at its recent annual meeting. Mr. Oberfell retired from Phillips last year and is now serving as a consultant for the Reconstruction Finance Corp. in Washington, D. C. He was honored May 1 by the American Petroleum Institute's Division of Refining with the presentation of a "certificate of appreciation" for his outstanding services to the oil industry in automotive research and the conservation of natural resources.

EDWARD C. BORREGO has been appointed general manager of Tropical Oil Co., affiliate in Colombia of International Petroleum Co. Ltd. He formerly was assistant general manager of International Petroleum in Peru. Mr. Borrego began his South American oil career in 1935 when he went to Venezuela as district superintendent of Creole Petroleum Corp. During World War II he served in the U. S. armed forces and during 1945 and 1946 in the U. S. State Department. He was associated with Standard Oil Co. (N. J.) in Europe before going to Peru in 1950.

Harry B. Britton

HARRY B. BRITTON has been elected a vice president of Trans-Arabian Pipe Line Co. on which he has been a consultant for the past several years. Following a period of service in the United States Navy Mr. Britton joined Shell Pipe Line Co. as a master mechanic in 1928. He left Shell in 1942 to become chief engineer of Plantation Pipe Line. Later he became general superintendent of this products line until called in as a Tapline consultant in June 1947. After a short period with Tapline he was assigned to Middle East Pipe Line Ltd. and remained with this project for two years, returning to Tapline in November 1949.

F. L. YATES is the head of the new Tampico offices opened by the Independent Exploration Co., of Houston, Texas, which does the exploration work for Sharmex, Mexican operation of the Sharpless Oil Co.

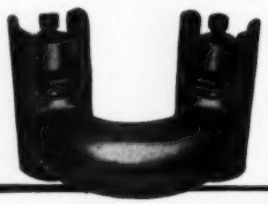
W. H. CREEL has been appointed assistant manager of the refining department of Phillips Petroleum Co., Bartlesville, Okla. He will be in charge of all manufacturing and engineering activities carried on in Bartlesville. W. A. McCarthy, superintendent of the Kansas City, Kansas, refinery for the past four years, has been appointed staff assistant to the manager, with his office in Bartlesville. Succeeding Mr. McCarthy, is H. G. Fair, who has been assistant superintendent of the Kansas City refinery. L. G. Molique, who has been in charge of planning and development in the department's aviation fuels division in Bartlesville, has been named assistant superintendent of the Kansas City refinery.

V. H. KING has been appointed to the newly created position of manager of General Petroleum Corporation's exploration department. In his new post Mr. King will be responsible for the coordination and correlation of all activities of all divisions of the department. He will be succeeded as supervisor of exploration in the Rocky Mountain district, by K. A. Gorton, his former assistant at Casper, Wyo.

K. A. van der Weg advances to supervisor of geophysics, Los Angeles, from the same position at Casper to succeed N. R. Shade retired. P. H. Gardett becomes assistant supervisor of exploration in California. He formerly was district geologist, Los Angeles. A. G. Alpha advances from district geologist, Montana, to regional geologist, with offices in Casper. F. R. Reeves takes over the position of geophysicist, Rocky Mountain division. He comes to General Petroleum from the Western Geophysical Co.

GENERAL HARRY H. JOHNSON, former assistant vice president of the Gulf Oil Corp., has resigned to take over the presidency of the Algonquin Gas Transmission Co. of Boston. Johnson, a resident of Mexico, where he was director of the joint U. S.-Mexico Anti-Hoof and Mouth Disease Commission, had been with Gulf since 1920.

6" MULE EAR RETURN JUMP HEADER
(1900 TYPE) FOR CRUDE FURNACE



Made in 5% Chromium-Molybdenum Steel
Design Conditions:–
Temperature - 900°F (482°C).
Pressure - 850 P.S.I.
Specifications:–
A.S.T.M. A.157/44.C5A.
BSS.1462/48.
LAKE & ELLIOT No. 14.

5" BULL NUT RETURN HEADER
(7000 TYPE) FOR COMBINATION GASOLINE VAPORISER AND REBOILER HEATER

Made in Carbon Steel
Design Conditions:–
Temperature - 825°F (440°C).
Pressure - 500 P.S.I.
Specifications:–
A.S.T.M. A.95/46. BSS 1560.
LAKE & ELLIOT No. 1A.

12 TON S143 JACK
HYDRAULIC SINGLE PUMP
Hydraulic and Mechanical Jacks are available in a range to suit practically every purpose

Strength & Pressure Tightness

Millennium-Key Cast Steel Fittings for oil refinery and chemical plants are manufactured throughout at Braintree by Lake & Elliot, Ltd. Each stage of the process is carried out by specially trained personnel, from the making of the patterns and actual castings through to the final machining, fitting, testing and inspection. The pattern shop, steel foundry and machine shops are all adjacently located, so that close liaison is maintained during all stages of manufacture. The foundry and machine shops are kept equipped with the most up to date plant and machines, and close metallurgical control is maintained by a competent staff of chemists working with modern apparatus. The inspection Department is completely independent of all production departments, so that final inspection and acceptance may be undertaken for our Customers or can be carried out in conjunction with Customers' own Inspectors.

LAKE & ELLIOT LTD
BRAINTREE, ESSEX, ENGLAND.
TELEPHONE: BRAINTREE 81
GRAMS: LAKE, BRAINTREE, ENGLAND

LAKE & ELLIOT STEEL CASTINGS MILLENNIUM

Govan, Ferguson, Lindsay, Kaminker, Maw, Langley and Keenleyside, Architects

THE HOSPITAL FOR SICK CHILDREN

EQUIPPED FOR MODERN MIRACLES

Stone & Webster Engineering Corporation was retained as Project Manager during the planning stage of the Hospital for Sick Children in Toronto and later supervised and directed the construction. This hospital provides the most modern facilities for the care of sick children and for medical research and instruction.

STONE & WEBSTER ENGINEERING CORPORATION

A SUBSIDIARY OF STONE & WEBSTER, INC.

Heads Advisory Committee

C. M. Vignoles, O.B.E., managing director of Shell-Mex and B.P. Ltd., has been elected chairman of the U. K. Petroleum Industry Advisory Committee in succession to C. M. Merrick, and has accepted an invitation from the Minister of Fuel and Power to be a representative of the oil industry on the Oil Consumers' Council.

Cooling Tower for Spain

Foster Wheeler Corp. has recently been awarded a contract by the California Texas Oil Co. Ltd., acting on behalf of Refineria de Petroleos de Escombreras S.A., for one four-cell induced draft cooling tower. This tower which is designed to cool 13,500 gpm of water will be erected at the Caltex refinery at Cartagena, Spain. The tower will be constructed of select heart grade California redwood with brass hardware and will employ monel fan blades and totally enclosed fan cooled motors.

Shell Helps Fight Locust Plague

Dr. John Hardy of Shell Chemical Corp. laboratories and an expert on pest control in the middle east, has been flown to Iran to aid in the fight against the locust plague now threatening that country. He will help direct the application of aldrin, a new insect toxicant of which as little as two ounces of aldrin, properly mixed with petroleum solvent, will serve to kill virtually all locusts on an acre tract. The locust infestation threatens 130,000 square miles of cultivated land in southern Iran.

To Move Offices

International Petroleum Co. Ltd. will transfer administrative offices from Toronto, Ont. to Florida. The company will continue to maintain an office in Toronto on corporate matters and as a point of contact for Canadian shareholders.

Book

Possible Future Petroleum Provinces of North America, edited by Max W. Ball, Arthur A. Baker, George V. Cohee, Paul B. Whitney and Douglas Ball; published 1951 by American Association of Petroleum Geologists, Tulsa, Okla., 358 pages, $4.00.

Seventeen geological societies, representatives of 33 oil companies, eight universities, 24 consulting geologists and 13 Federal, state and provincial geological surveys pooled their knowledge in a symposium to forecast where more oil might be discovered on the North American Continent.

This is an attempt to outline where discovery of new oil is "possible," which does not mean "probable" and still less "proved." The idea is to obtain a picture of where undiscovered oil "might" be found. The criteria of possibility are, first, the presence in an unexplored region of large volumes of sediments, preferably marine. The symposiarchs neglect all regions where the sediment are less than 1,000 feet thick; their limit of thickness is 20,000 feet, which represents about the present limit of deep drilling. Other criteria of possibility are oil or gas seeps, unconformities, and wedge belts of porosity. No attempt is made to figure future discoveries in barrels, the prognosis is confined strictly to a demonstration of where conditions are such as to favor oil accumulate, with no assurance that oil will be found there. The final product of the symposium is the accompanying map.

Japanese Operations Larger

Mitsubishi Oil Co. has repaired the war damage to its refinery at Kawasaki, near Tokyo. The plant now has a capacity of 4,500 barrels daily and will be expanded to 7,700 barrels daily. A lube plant will be in operation in 1952.

Before the war Mitsubishi Oil was exclusively engaged in refining. It now has purchased marketing properties of the Mitsubishi Trading Co. and other outlets. Goal of the company is to market about 7.5 percent of the oil consumed in Japan.

American affiliate of Mitsubishi Oil Co. is Tide Water Associated Oil Co. which owns a half interest. Currently the United States company is investing $1,690,000 in the expansion program.

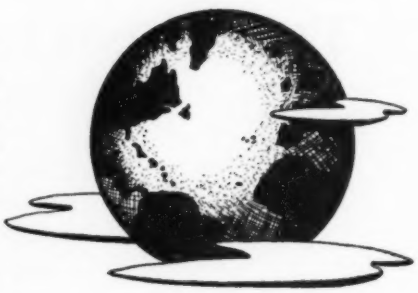
Anglo Iranian Officer Drowned

Under tragic circumstances, J. R. Parry, a field transport manager of Anglo Iranian Oil Co. Ltd. was drowned in the Karun River, Persia, on March 22 while trying to save a companion when their raft capsized. Before joining AIOC in 1947, Mr. Parry was technical representative for Leyland Motors Ltd. in the Near East. During the war he was attached to the Fighting Vehicle Proving Establishment of the Ministry of Supply and was in charge of the testing of Leyland tanks. Later he was appointed member of a team of technical experts who entered Germany closely behind the army to assess the productive capacities of captured factories.

OFFERING A SERVICE

..unique in its function and scope

..available to the Petroleum Industry throughout the world



International Petroleum Consultants, Ltd., operating as a group of technically-trained scientists and engineers, each a specialist in his field, performs a service unmatched in the petroleum industry. Problems pertaining to petroleum engineering, geology, paleontology and those arising in the development and production of oil . . . are channeled through this group, then assigned to one of its service companies for the detailed studies. The final results and laboratory conclusions, before they are released to the client, are again routed through this group for final analysis and underwriting.

This service . . . *knowledge* and *complete laboratory facilities* . . . was developed to meet the needs of the petroleum industry on a world-wide basis. It is a service designed to help you attain maximum efficiency and economy in the exploitation of oil reserves.

International Petroleum Consultants, Ltd.

Serving the world-wide Petroleum Industry through these service companies

Oil Properties Consultants, Inc.
709 S. Fair Oaks Ave., Pasadena 2, California
Cable Address PEACO

Petroleum Engineering Associates, Inc.
709 S. Fair Oaks Ave., Pasadena 2, California
Cable Address PEACO

Geological Engineering Consultants, (Cuba), Inc.
Calzada 109, Apt. 2, Vedado, Habana, Cuba
Cable Address GEOLCUBA

Petroleum Industry Consultants, C. A.
Edificio Carabobo, Caracas, Venezuela
Cable Address PETICON

At the service of refiners:—Foster Wheeler's extensive know-how is available for the design and construction of all types of crude distillation units—both large and small.

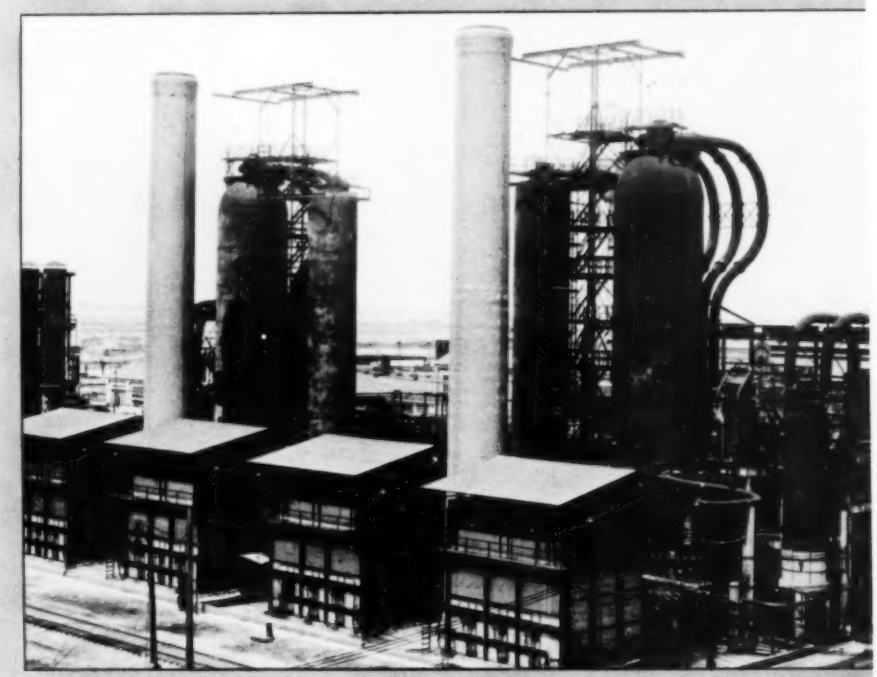
A detailed description of a recently completed 63,000 barrel per day crude unit was presented in the April issue of Heat Engineering. Copies are available on request. Write for HE-4-51 to:

FOSTER WHEELER CORPORATION

165 BROADWAY, NEW YORK 6, NEW YORK

more than **500** process units designed and constructed by Foster Wheeler

when you're leaving the refinery..



...it's a comforting feeling to know that those process units out there were designed 'right'... were built 'right'... and have a record of proven dependability.

The two two-stage crude distillation units in the photograph were designed and constructed by Foster Wheeler in 1931 *and they're still running... every day.*

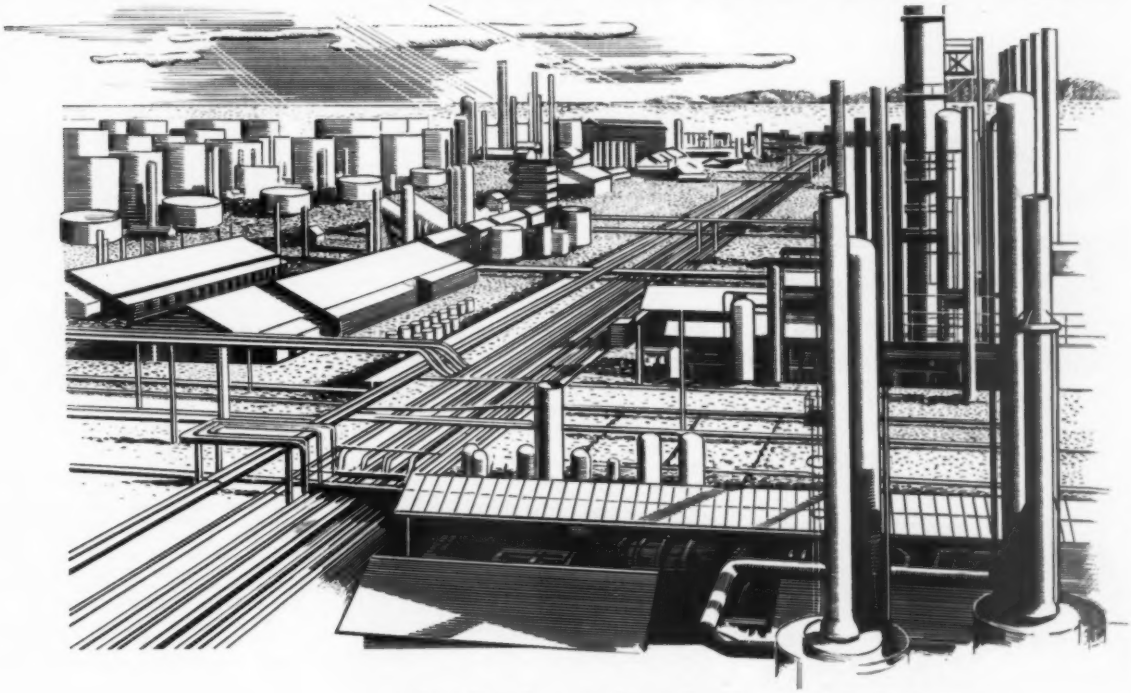
FOSTER WHEELER CORPORATION

165 BROADWAY, NEW YORK 6, NEW YORK

TO SUPPLY A BASIC

DEMAND

HALFWAY 'ROUND THE WORLD



...for high quality fuels and lubricants
...for industry and transportation

From oil producing or refining centers in the Persian Gulf; in Bordeaux, France; in Cartagena, Spain; in Rotterdam, Holland—come Caltex petroleum products. Spreading out from these are many convenient, reliable Caltex supply points throughout the Eastern Hemisphere. At these same points Caltex engineering service is available.

This is the Caltex combination of quality products, ready supply and technical service that management relies on—for maximum efficiencies and economies of operation.

CALTEX
REG T.M

CALTEX PETROLEUM PRODUCTS

SERVING EUROPE...AFRICA...ASIA...AUSTRALASIA

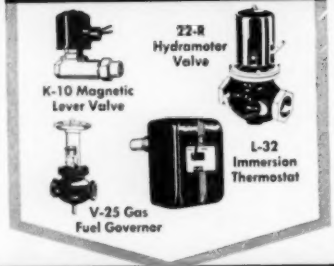
GEOLOGRAPH
WELL-LOGGING SERVICE
OK for EXPORT

Geolograph's mechanical well-logging unit is easily transported; is jungle-proof and desert-proof! Neither sand storm, humidity nor blazing sun affects Geolograph's accuracy in providing a foot-by-foot record which shows depth, connections and down time—at all times.

ABILENE, HOUSTON, ODESSA & WICHITA FALLS, TEX. • SHREVEPORT & BATON ROUGE, LA. • BAKERSFIELD, CALIF. CASPER, WYO.

TIME WILL TELL
THE GEOLOGRAPH CO. INC
P. O. Box 1281 Oklahoma City 1, Okla.

AUTOMATIC CONTROL
for product or process



GENERAL CONTROLS
801 ALLEN AVENUE GLENDALE 1, CALIFORNIA

Manufacturers of Automatic Pressure, Temperature, Level and Flow Controls
FACTORY BRANCHES: Baltimore 5, Birmingham 3, Boston 16, Buffalo 3, Chicago 5, Cincinnati 2, Cleveland 15, Dallas 2, Denver 4, Detroit 21, Glendale 1, Houston 6, Indianapolis 4, Kansas City 2, Minneapolis 2, Newark 6, New York 17, Philadelphia 23, Pittsburgh 22, St. Louis 3, San Francisco 7, Seattle 1, Tulsa 6, Washington 6.
DISTRIBUTORS IN PRINCIPAL CITIES

DISTILLATION

1951. 6 x 9. 696 pages, 293 illustrations, 97 tables. $14.00.

Contents:

1. Theory.
   By Arthur and Elizabeth Rose, State College, Pa.
2. Ordinary Fractional Distillation.
   By Arthur L. Glasebrook and Frederick E. Williams, Hercules Powder Co.
3. Extractive and Azeotropic Distillation.
   By Carl S. Carlson, Esso Laboratories.
4. Distillation of Liquefied Gases and Low-Boiling Liquids.
   By Arthur and Elizabeth Rose.
5. Distillation Under Moderate Vacuum.
   By John R. Bowman and R. Stuart Tipson, Mellon Institute of Industrial Research.
6. Distillation Under High Vacuum.
   By Edmond S. Perry and John C. Hecker, Distillation Product Industries.
7. Sublimation.
   By R. Stuart Tipson, Mellon Institute of Industrial Research.

order from

BOOK DEPT.
WORLD PETROLEUM
2 W. 45th St., New York 19, N. Y.

Facts and Figures

The ninth edition of Petroleum Facts and Figures, one of the oil industry's most authoritative books on its vital statistics, will be off the press around April 15, the American Petroleum Institute has announced. The new edition is the first since 1947. It is broader in scope than any of its predecessors, containing 468 pages of facts and figures, more than twice the number available in the 1947 book. The book will be made available to the industry and to the public at $2.50 per copy. Usual API discounts will be allowed for bulk orders by the Department of Information, American Petroleum Institute, 50 West 50 Street, New York 20, New York.

Book Review

Metalworking Lubricants, by E. L. H. Bastian (Shell Oil Co.); published 1951 by McGraw-Hill Book Co., New York, 385 pages, $6.00.

This book written by a senior engineer of a great oil company, is a comprehensive discussion of the many types of lubricants and fluids used in processing or working of metals that are operations in the daily routine of every machine shop. From his knowledge and experience the author furnished practical know-how on metal working lubricants, cutting fluids, drawing fluids and compounds, extrusion lubricants, forging lubricants, rolling oils, metal-coating processes; heat-treating, quenching and tempering oils, machine tool lubrication; lubrication of press, drawbench and forge equipment, common sense in the use of lubricants, quality control of lubricants, methods of testing and specifications for lubricants. However, this is no mere rule of thumb book; the basic theories of metalworking lubricants is also presented so that shopmen and supervisors will see how to use them effectively and why. May be ordered through the WORLD PETROLEUM Book Dept., 2 West 45th St., New York 19.

Tracy T. Word, Jr. Edmond L. Lorehn

Nomads Select National Leaders

Edmond L. Lorehn, executive vice president of Cameron Iron Works, Houston, has been elected chairman of the national board of regents of the Nomads. He succeeds Fred C. Ripley, Jr., of International Derrick and Equipment Co., Los Angeles, who served during the past year. Tracy T. Word, Jr., sales manager of Well Equipment Manufacturing Co., Houston, succeeded Lee J. Laird of Baash-Ross Tool Co., Los Angeles, as national secretary-treasurer.

After his service in World War I, Mr. Lorehn went to work in the oil fields in 1918 as roustabout, roughneck and toolpusher for J. S. Abercrombie. In 1920 Mr. Abercrombie purchased the then small and obscure Cameron Iron Works and appointed Ed Lorehn as its manager. When the company was incorporated a few months later, he was named its secretary-treasurer. In 1928 he became vice president and general manager in addition to his duties as secretary-treasurer. He has been an active member of the Houston chapter of Nomads for ten years. In 1950 he was elected president of the club and, subsequently, a national regent.

Mr. Word has been closely associated with the oil industry all his life. The son of the founder of one of the first independent oil well supply organizations on the Gulf Coast, he joined the T. T. Word Supply Co. in 1935 and later joined the Well Equipment Sales organization. He was promoted to sales manager in 1946.

Dr. and Mrs. Sidon Harris disembark from an American Airliner after a 10-day visit in Mexico with oil company officials. Dr. Harris, president of Southern Geophysical Co. of Fort Worth, is making plans for his company to do seismic exploration work in the Republic of Mexico. He was also accompanied to Mexico by his interpreter, John Hudson, a native of Mexico who was formerly connected with the oil industry in the republic.

Synchronous Generators Bulletin

A new bulletin on Tri-Clad high-speed synchronous generators has been announced as available from the General Electric Co., Schenectady 5, N. Y. Designated as GEA-5470, the publication covers generators for standby, portable, and prime-source power in ratings from 1,875 to 50 kva with frequencies of 60 and 400 cycles.

To Increase Line Capacity

Salt Lake Pipe Line Co. is planning to increase the capacity of the products line from Salt Lake City to Pasco, Wash., from 17,500 to 22,000 barrels. Two new pump stations will be built. Cost of the project including installation of additional storage will be about $1,000,000.

JUST OUT

NEW SIXTH EDITION

PRACTICAL OIL GEOLOGY

By DORSEY HAGER

Consulting Geologist and Petroleum Engineer

Sixth Edition. 589 pages, 5 x 7¼, 210 illus., $7.50

THIS standard guidebook on petroleum geology approaches the field from a clearcut, practical viewpoint, showing the essential facts and practices relating to the occurrence of oil and its extraction. Emphasizing the important role geology plays in finding and developing natural gas and oil, the book covers the initial steps in the search for oil in undeveloped areas—the selection of sites for testing—the application of geology in drilling—and its value in the production of gas and oil. Among additions to this new edition are a section of Veatch's Rule, a map of the basins of the U. S. favorable for gas and oil, section on paleotechtonics, etc.

WORLD PETROLEUM BOOK DEPT.
210 45th St., New York 19

G-E STEAM TURBINE GENERATORS
for . . . Factories . . . Mills . . . Utilities

With the installation since 1902 of over 75 million KW General Electric leads the world in the production of steam turbines. This half century of experience assures the reliability, efficiency and long time trouble-free operation of each General Electric steam turbine. Leadership in engineering and manufacturing skills result in modern turbines which are designed and built for you.

A STEAM TURBINE DESIGNED FOR YOUR OPERATION!

Form-wound coils being fitted into the slots of the generator armature.

General Electric steam turbines are built for steam pressures ranging from atmospheric to over 1500 pounds per square inch, steam temperatures to over 1000 F and back pressures from vacuum to several hundred pounds per square inch. Carefully designed, engineered and pre-tested General Electric steam turbines can be built for your particular operating conditions.

GENERAL ELECTRIC SERVICE IN THE FIELD! All parts are coordinated to form a compact and smooth running unit. Factory built replacement parts are interchangeable with original parts without extensive field adjustment. A staff of competent engineers is maintained in the field to furnish information relative to the turbines and their application, to aid in the installation and to instruct in care and operating procedure of your General Electric steam turbine generator

For full information on G-E steam turbine generators send for manual GEA 3277-B.

1A-51-128

See your nearest General Electric representative for further information.

General Electric S. A.—Buenos Aires, Rio de Janeiro, São Paulo, Montevideo, Mexico, D. F. International General Electric, S. A.—Caracas, Maracaibo, Bogota, Medellin, Cali, Barranquilla, San Juan. General Electric Cubana, S. A.—Habana. International Machinery Company—Santiago, Lima, La Paz, Guayaquil. Australian General Electric Pty., Ltd., Sydney. Andersen, Meyer and Company, Ltd., Hong Kong. Int. Gen. Elec. Co. of N. Y. Ltd., Crown House, London, England. Int. Gen. Elec. Co. (India) Ltd., Thackersey House, Bombay. Int. Gen. Elec. Co., Inc. of Java, Batavia. N.E.I. Int. Gen. Elec. S. A. Inc. San Juan, Puerto Rico. General Electric (P. I.) Inc., Port Area, Manila. South African Gen. Elec. Co., Ltd., Johannesburg. N. E. & E. Co., Ltd., Wellington, New Zealand.

INTERNATIONAL GENERAL ELECTRIC CO., INC.

New York, N. Y., U.S.A. Schenectady, N. Y., U.S.A.

DR. RALPH C. TALLMAN has been named director of research for Lion Oil Co. He has been manager of the planning and survey department of Lion Oil's research division since June 1950, and replaces Dr. Frank J. Soday, resigned. Dr. Tallman was project leader and patent chemist in the central research laboratory of Allied Chemical and Dye Corp. at Morristown, N. J., during the seven years immediately prior to his affiliation with Lion Oil.

C. C. PRYOR has joined the W-K-M organization as process applications engineer, and will devote his efforts to business with the gas and gasoline plants, refineries and petro-chemical phase of the oil industry. He formerly was associate editor of "The Refiner".

STANLEY LEARNED was elected executive vice president and assistant to the president, at the recent annual meeting of Phillips Petroleum Co. W. W. Keeler, formerly vice president of refining, has been elected a director, and vice president, and assistant to the executive vice president. C. C. Tate was appointed manager of the refining department. J. E. Bogk was appointed chairman of the operating committee.

RICHARD K. HUEY, who has been vice president in charge of Deep Rock Oil Corporation's production division, has been named assistant to the president, and is succeeded by Carl A. Houy, who has been general superintendent since March, 1950. In this new capacity, Mr. Huey will work on special assignments involving producing properties.

COLBERT H. MARSHALL of Oklahoma City has been elected a vice president of Ashland Oil & Refining Co. He will continue to have his headquarters in Oklahoma City and will be in charge of crude oil production. The office of vice president in charge of production is a newly created position.

Houston hospitality at its best in the completely air-conditioned RICE HOTEL

1,000 ROOMS

RATES FROM $4

HOME OF THE FAMOUS EMPIRE ROOM—nationally known orchestras play nightly in Southland's finest dining-dancing rendezvous.

When you come to Houston, Texas, you'll want your headquarters to be in the heart of town, close to all important office buildings, stores, shops, theaters. So enjoy the cool, comfortable, luxurious accommodations of the centrally located Rice. Four fine restaurants. Thousand-car garage.

"Houston's Welcome to the World"

B. F. ORR, General Manager

Frank T. Clark Frank Cooter

FRANK T. CLARK of Ft. Worth has been appointed chief geologist for Cities Service Oil Co. (Del.). Mr. Clark joined the company in 1924, as Kansas division geologist. He has been in various Texas areas since 1935. Frank Cooter steps into the new position of exploration field division manager after serving as division landman for Cities Service at Ft. Worth for three years.

A. S. C. HULTON has been appointed vice president in charge of transportation and supplies for Shell Oil Co. He succeeds D. B. Hodges, on leave as director of supply and transportation for the Petroleum Administration for Defense. Mr. Hulton joined Shell Oil in 1936 at Long Beach, Calif. He came to New York in 1941 as assistant manager of shuttle tanker operation.

Ernest Arthur Satchell

The death on April 11 of Ernest A. Satchell deprives the British oil industry not only of one of its leading production engineers, but also of one of its most vivid personalities. Mr. Satchell went to America in 1907 to work in the gauger's office of California Oilfields Ltd. at Coalinga. After World War I during which he served in the army he returned to California, but soon joined the Huasteca Petroleum Co. in Mexico. Later, he was transferred to Venezuela where he became general superintendent of the Lago Petroleum Corporation's operations at Maracaibo.

He joined the Iraq Petroleum Co. in 1930 when the scheme for the production of four million tons per annum from the Kirkuk field was being formulated. He brought with him experience of limestone production in the fabulous Golden Lane of Mexico, but at that time, few men would have had the foresight or the courage to concentrate production on a 10-mile stretch of the 60-mile Kirkuk reservoir. From the very beginning the production system was devised by Mr. Satchell to make full use of reservoir characteristics. Taking advantage of the natural system of communication throughout the reservoir, the original scheme for a production of 90,000 barrels per day was from 14 flowing wells covering a 10-mile stretch of the Baba dome, thus concentrating production facilities and reducing gathering systems to a minimum.

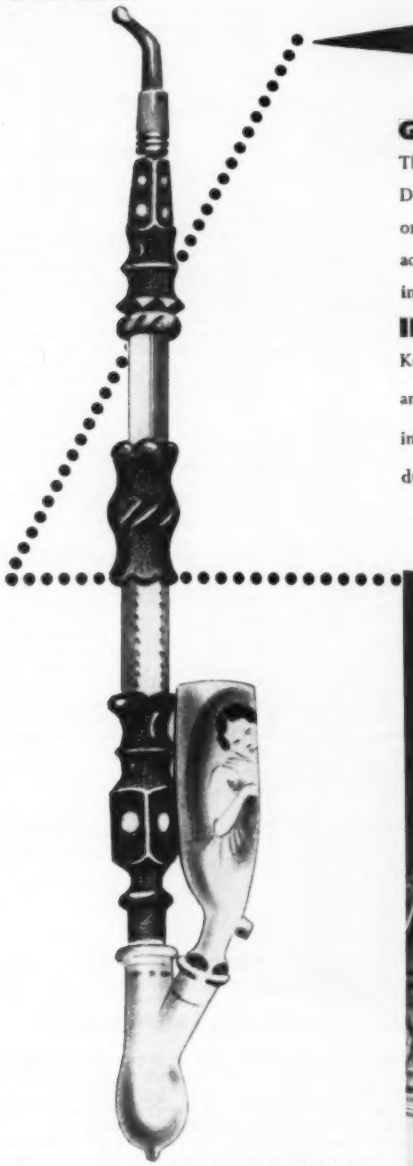
In the post-war years Satchell was responsible for the expansion of production to the present rate of 7½ million tons per annum, still from the Baba dome, and of planning the production of 20 million tons from the Kirkuk field. At the time of his death the installation of facilities for this quantity was well advanced and everything will be ready when the 30" line from Kirkuk to Banias comes into operation at the end of 1952.

American Meter Co. Elects Hamilton President

William G. Hamilton, Jr. has been elected president of the American Meter Co. He has been vice president in charge of sales. His successor in the position is C. Benson Dushane, Jr. of Chicago, formerly mid-west sales manager.

NUMBER SEVEN

TALKING OF PIPES



from "The Pipe Book"
by Alfred Dunhill

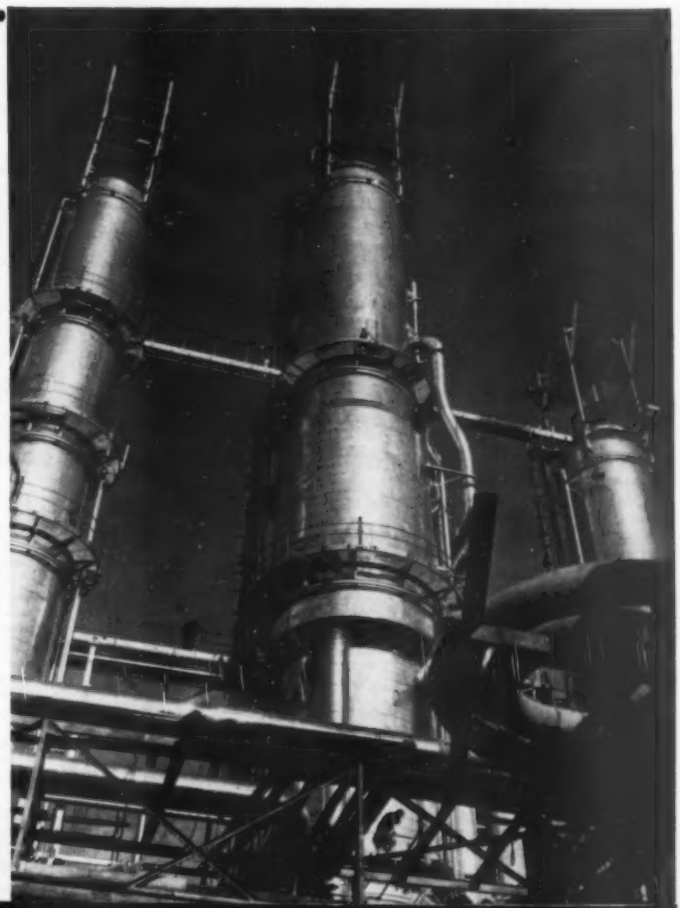
GERMAN PORCELAIN PIPE

The typical Central European pipe of today can be traced to the eighteenth century Dutch clay. The stem is, however, broken short and the bowl is inserted into a holder or base. By this arrangement, both bowl and stem are upright and the deleterious tobacco juices drain down into the holder. Such a pipe is capable of infinite variations in decoration.

INDUSTRIAL PIPING AND ITS HEAT INSULATION

Kenyon make a speciality of furnishing and applying heat insulation for oil refineries and petroleum chemical plants throughout the world. A complete service is offered including technical guidance and supervision on site at all stages of erection and production. Our engineers are available for consultation at all times.

WILLIAM KENYON & SONS (AMERICA) LTD
136 LIBERTY STREET, NEW YORK, 6, N.Y.
WILLIAM KENYON & SONS LTD., DUKINFIELD, CHESHIRE, ENGLAND



"A Shell Photograph"

KENYON *Planned* HEAT INSULATION

KH117

New Wagner-Morehouse Plant

Wagner-Morehouse, Inc., In New Plant

Wagner-Morehouse, Inc., recently celebrated its fifteenth anniversary as a producer of "Streamline" oil well drilling and servicing equipment by occupying its own modern manufacturing plant located at 5909 Randolph Street in Los Angeles. Organized in 1936, the company has a background of more than a quarter century of experience in its field.

Chas. D. Wagner, president, and Harry C. Morehouse, vice president, both have spent practically their entire business careers in oil field engineering and manufacturing activities.

The new plant occupies two acres of ground in the fast growing industrial section of East Los Angeles. It consolidates two individual units previously operated, a derrick and fabricating plant and a machine and assembly shop, into one integrated unit. An area of approximately 50,000 square feet is provided for the fabrication of derricks, portable rigs, and structural work. The machine and assembly department incorporates the most modern steel construction and equipment throughout, consisting of about 10,000 square feet of floor space, with an attractive two-story building fronting the property and housing the general offices and engineering departments.

Wagner-Morehouse, Inc., specializes in the design and construction of complete mobile integrated drilling rigs including all the necessary component parts of power plant, drawworks, rotary drive, and telescoping derrick with strung-up block and hook, all mounted on one trailer; with complete dual engine, dual mud pump unit mounted on a second trailer; and all drilling accessories such as rotary table and base, platforms, mud tanks, shale shaker, etc., on a third trailer or truck.

New Venezuelan Labor Contract

The Venezuelan government intervened in early April to break the stalemate which had developed in protracted discussions of a new collective labor contract. The oil workers and the operators failing to come to any agreement, the government stepped in and decreed compromise measures which have been accepted by both negotiating parties. These terms will govern labor relations in the industry for the next thirty months.

The new contract will cost the companies an estimated $300 million additional per year. The average worker in the industry previously received about $10 per day in take-home pay, according to oil company figures, plus about $5 in benefits such as housing, schools, subsidized commissaries, pensions, savings plans, etc.

The workers' representatives had presented a list of 140 separate clauses, which the companies estimated would have cost an additional $1 billion per year. They rejected the demands in their entirety, pointing out that the average annual value of all exports from Venezuela including petroleum was only slightly over $1 billion, while the national budget is considerably less. The labor representatives refused to bargain on the basis of the old contract, however, and it was at this point that the government entered the picture.

New Book

Liquid Extraction, by Robert E. Treybal; published 1951 by McGraw-Hill Book Co., New York, 422 pages, $7.50.

This book is an engineering text on the separation of mixtures of liquids by means of a solvent. This operation is well established in the petroleum industry for the production of lubricants, the recovery of aromatics, butadiene, desulfurization and numerous other petrochemical operations. Heretofore there was no book that completely covered this subject from both the physical-chemical and the technical standpoints. An examination of this work shows that the author has provided ample coverage of the subject, the theory of liquid-liquid extraction is treated from all angles, so that technologists can see the basic reasons underlying every situation likely to be encountered. It is a good book to have. Copy of this volume may be obtained from the Book Dept. WORLD PETROLEUM, 2 West 45 St., New York 19.

To Manufacture McEvoy Valves

Newman, Hender & Co. Ltd., Woodchester, England, now is producing an English version of the McEvoy gate valve, to be called the "Newman-McEvoy" valve. The valves made by Newman, Hender & Co. in England are identical with the valves manufactured by McEvoy in Houston, with all parts interchangeable. Newman, Hender & Company's world-wide distribution facilities will make the valve more readily available to oil producers in remote sections of the globe.

BOOKS

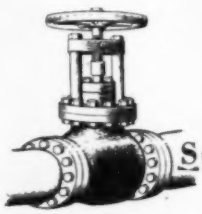
ELEMENTS OF OIL RESERVOIR ENGINEERING—Sylvain J. Pirson	$ 7.00
FIELD GEOLOGY—Frederick H. Lahee	$ 6.50
FUNDAMENTALS OF THE PETROLEUM INDUSTRY—Dorsey Hager	$ 4.50
GEOLOGY OF PETROLEUM—2nd edition—Wm. Harvey Emmons	$ 7.50
GAS ENGINEERS' HANDBOOK—Gas Engrs. Handbook Committee	$ 9.00
HANDBOOK BUTANE PROPANE GASES—Butane Propane News	$ 5.00
HANDBOOK FOR CHEMICAL ENGINEERING—Donald M. Liddell	$ 8.00
INCREASING THE RECOVERY OF PETROLEUM—Vol. I & II	$10.00
LIQUID FUELS—Harold Moore	$ 6.50
MARINE GEOLOGY—P. H. Kuenen	$ 7.50
METALWORKING LUBRICANTS—E. L. Bastian	$ 6.00
MATERIALS ENGINEERING OF METAL PRODUCTS—Norman E. Woldman	$10.00
NATURAL GAS & NATURAL GASOLINE—Huntington	$ 8.00
OIL FIELD EXPLORATION AND DEVELOPMENT—A. Beeby Thompson	$20.00
OIL PROPERTY VALUATION—P. Paine	$ 3.50
OIL RECORD—PETROLEUM INDUSTRY PROJECTS	$ 4.00
OUR OIL RESOURCES—L. M. Fanning	$ 5.00
PETROLEUM GEOLOGY—R. M. Landes	$10.00
POLYMERIZATION OF ACETYLENE—Karl Kameyer	$17.50
PETROLEUM REGISTER (International Petroleum Register) 28th Edition, 1950	$15.00

TO ORDER WRITE TO

Book Dept. World Petroleum

2 W. 45TH ST. NEW YORK 19, N. Y.

CUT ALONG THIS LINE FOR FILING



Spirax Letters – No. 5

Starting here

STEAM FOR POWER should be high in pressure and Superheated: STEAM FOR PROCESS should be low in pressure and "Saturated", and as dry as we can make it.

Steam quality (its dryness) depends very much on the way we distribute the steam. So we will start at the boiler-stop valve.

If the steam is Superheated it is dry and will remain dry until it loses its excess temperature. If the steam is "Saturated" it begins to condense as soon as it leaves the boiler. The more moisture the steam carries the poorer its quality for process.

The first object, then, is to remove the water from the steam distribution pipes: the second object is to remove the moisture particles from the steam itself before the steam reaches the process.

Starting at the boiler stop-valve, there should be an ample collecting pocket for condensate and priming, drained through a strainer and steam trap of the right type and capacity. A suitable choice is a bucket trap ('Odgen' type).

Drawing T.125 (copies on request) shows the correct arrangements for draining mains.

SPIRAX HEAT TRANSFER

SPIRAX MANUFACTURING CO. LTD., CHELTENHAM, ENGLAND

Phone: Cheltenham 5175-6 Grams: Cheltenham

LONDON OFFICE: 28 Victoria St., S.W.1. *Abbey 6101-3832*

REQUEST SLIP FOR FURTHER INFORMATION

Please send a copy of Drawing T125 showing steam mains drainage.

NAME .....

ADDRESS .....

PET 651

PROGRESS at DURBAN

OIL'S BENEFITS know no barriers. From Titusville to Tampico, from Maracaibo to the Middle East, from Spindletop to Sumatra, the march of petroleum progress has crossed one international boundary after another.

And now Oil's history reaches out to touch the lovely city of DURBAN where soon Standard-Vacuum will start to build SOUTH AFRICA'S first crude oil refinery.

PETROLEUM—PARTNER TO PROGRESS

Trace the pattern of Petroleum and you walk in the footsteps of Progress: the kerosene lamp . . . the automobile . . . oil for factory and farm machine . . . oil for air transport . . . OIL supplies one-fourth of all the useful energy in our world today.

OIL means PROGRESS, for it helps produce more FOOD . . . more GOODS . . . more needed SERVICES . . . more COMFORTS . . . for PEOPLE everywhere.

STANDARD-VACUUM OIL COMPANY

A name that stands for "Progress" in the East

26 BROADWAY, NEW YORK 4, N. Y.

AUSTRALIA • BURMA • CEYLON • HONG KONG • INDIA • INDO-CHINA • INDONESIA
JAPAN • KENYA • MADAGASCAR • MALAYA • NEW ZEALAND • PAKISTAN • PHILIPPINES
PORTUGUESE EAST AFRICA • RHODESIA • SINGAPORE • SOUTH PACIFIC ISLANDS
SOUTH WEST AFRICA • TANGANYIKA • THAILAND • UNION OF SOUTH AFRICA

Book Notice

The Fischer Tropsch and Related Syntheses, by Henry H. Storch, Norma Golumbic, and Robert B. Anderson; published 1951 by John Wiley & Sons, Inc., 610 pages $9.00.

When the allied armies entered Germany in 1945, teams of British and American engineers inspected German documents and interrogated German technologists on the many aspects of German technology. They collected large masses of scientific knowledge and data of high practical value in research and development work related to fuels and chemical synthesis applied to petroleum. The authors have digested and critically analyzed this information as regards the Fisher-Tropsch synthesis in its relation to the production of liquid fuels and the aliphatic organic compounds which are now the object of the large and expanding petro-chemical industry. They also present with great thoroughness a review of the theory and practice of catalysis with especial reference to the 'oxo" and isoparaffin syntheses on the basis of actual plant processes and hitherto unavailable documents. Copies available through the Book Dept. WORLD PETROLEUM, 2 West 45 St., New York 19.

New Field in Saudi Arabia

Arabian American Oil Co. has discovered a new field of unknown importance in Saudi Arabia. A wildcat drilled about 40 miles south of the Ain Dar field and 20 miles west of the city of Hofuf topped the D series of the Arab zone at 6,900 feet. A drill steam test showed the oil to be sour with a gravity of 30.5°. The pay zone is the major producing zone found in other Arabian fields.

Thus far a complete test has not been made of the well. Storage is being moved in for such a test. Meanwhile the rig will be moved to a new location to drill a second well.

In April production of crude in Saudi Arabia from the four active fields averaged 695,121 barrels per day. This compared with 638,938 barrels daily in March and 631,684 barrels daily for the year to date.

R. A. Carden

Death of R. A. Carder

Mr. R. A. Carder, chairman and managing director of The Esso Petroleum Company, Ltd., died on April 28, after a short illness. He was 59 years old and had served the company continuously for 31 years. After the first world war, during which he served in the Royal Navy, he joined the Anglo-American Oil Co. in 1920 as secretarial assistant with special assignments. He was elected a director in 1933, managing director in 1940 and chairman and managing director in 1949.

Petrofina Buys Signal Interest

The Signal Oil and Gas Co., of Los Angeles, has sold out its interest in the Mexican-American Independent Oil Co., pioneer percentage-of-production driller in Mexico, to Petrofina, Belgian oil firm. Petrofina had owned 20 percent of the American Independent Oil Company's interest in Cima but up to now it had not been an official signatory owner. Under the new Cima set-up, Petrofina owns 43⅓ percent of the operation; American Independent, 43⅓ percent, and Edwin W. Pauley, Los Angeles, credited with engineering the original Pemex deal, 13⅓ percent.

To date the company has drilled five wells in three years at a cost of over $3-million. The results have been a single 200-barrel-a-day producer and a large gas supply in the jungles of southern Mexico, far from a commercial market.

Petrofina's new participation in Cima means the company will drill at least two additional locations, both of which are now being prepared, according to the firm's executives.

U. S. observers here believe Petrofina decided to stimulate Cima's operations on the theory additional contracts with other foreign operators are in the offing. A previously secret clause of Cima's contract with Pemex concedes the drillers a "favored company" arrangement. Under this provision the company is entitled to the best terms reached by Pemex with any other contractor. Cima, it is reported, is already enjoying benefits because of this clause due to the "slightly better" terms granted Edwin Pauley in his independent operation in northern Mexico.

Nelly Heads Bufnel Corporation

H. M. Nelly, Jr., widely known in oil industry circles through his former connection with Refinery Maintenance Co. and previously with J. F. Pritchard & Co. has been made president of Bufnel Corp. of Hollydale, Calif. Bufnel Corp. is engaged in steel fabrication serving principally the oil and aircraft industries and their suppliers.

New Condensed Catalog

IDECO, a division of Dresser Equipment Co., has just published Condensed Catalog 51 covering all IDECO equipment. It contains photos, descriptions, and specifications on the entire IDECO line of drilling, servicing, and general oilfield equipment. For a copy write to IDECO, P. O. Box 1331, Dallas 1, Texas.

INTERNATIONAL PAINTS . . .

. . . all along the line

Trade Mark Registered

For tankers, refinery plant, storage tanks, road and rails wagons you need the finest protective paints—those made specially for the job by "International." Remember, it pays to use "International" all along the line.

International Paints Ltd

GROSVENOR GARDENS HOUSE, GROSVENOR GARDENS, LONDON, S.W.1.

Associated Companies and Agents throughout the World.

piping maintenance costs more now!

You do less of it by using Dependable Quality

CRANE VALVES

...That's why more Crane Valves are used than any other make

No. 3602 Small Steel Gate Valve

easy to use...easy to keep on the job

You'll have much less valve maintenance wherever you install Crane 600-Pound Small Steel Gates. Use with recommended trim on oil or oil vapor, steam, water, air, or gas.

Compact yet rugged—light yet strong—these are truly small steel valves with big valve features. They sacrifice nothing that insures dependability and tight seating, easy operation, and convenience in keeping them in top-notch working condition.

Supplied in sizes 2 inches and smaller, No. 3602 valves are engineered to the standards that make Crane Quality your best choice in valves of every type.

CRANE

CRANE CO., *General Offices:*
836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas

Dealers

Crane Co.,
General Offices:
836 S. Michigan Ave.,
Chicago 5, Illinois, U.S.A.

In Great Britain:
Crane Ltd.,
45-51 Leman St.,
London E.1, England

In Canada:
Crane Limited
1170 Beaver Hall Square,
Montreal, Quebec

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

American Cyanamid Technical Representative

American Cyanamid Co. has appointed W. D. Thomas, Jr., as technical representative of the petroleum chemicals department. His new duties will involve the assembling and correlation of technical information. J. B. Peeso, Jr., will succeed Mr. Thomas as group leader of the petroleum chemicals laboratory at Stamford, Conn.

New API Publications

The American Petroleum Institute's division of refining announces the availability of two new publications; "Part IV—Low-Pressure Storage Tanks," of the Manual of Recommended Practices for Refinery Inspections, price $1.00, and API Standard 600: "API Standard on Flanged and Welding-End Steel Wedge-Gate and Plug Valves for Refinery Use," price $1.50. Publications are available from the American Petroleum Institute, 50 West 50th Street, New York 20, N. Y.

Book Review

Distillation, edited by Arnold Weissberger, with eight contributors; published 1951 by Interscience Publishers, New York, 668 pages, $14.00.

This is a comprehensive treatise on the theory of distillation, and this reviewer is moved to say that it is a valuable one in its field and particularly to petroleum refiners and operators of petrochemical works, whose whole business is to distill simple and complex organic liquids. The art of distilling has become a rigidly exact science, and at every hand efficient practice depends on intelligent application of fundamental principles. The editor and his collaborators have lucidly arranged these principles for operation supervisors. Theory, embracing the whole field, covers 172 pages. Then follow treatments of apparatus and procedures of ordinary fractional distillation, extractive and azeotropic distillation, moderate and high vacuum distillation, and sublimation. It is here impossible to indicate the wealth of details that come under these heads. The least that can be said that the book is a guide to all usual and many unusual circumstances that arise in this complex art. Copy of this volume may be obtained from the Book Dept. WORLD PETROLEUM, 2 West 45 St., New York 19.

Vice President of Jefferson Chemical

Dr. Max Neuhaus, formerly with The Texas Co. and Texaco Development Corp. has been elected a vice president of Jefferson Chemical Co., jointly owned by The Texas Co. and American Cyanamid Co. The company is engaged in the manufacture of chemicals from petroleum hydrocarbons.

Completes New Line

Richfield Oil Corp. has completed a new 14-inch pipe line linking Los Angeles with San Joaquin and Cuyama valley fields. The $7-million line has a capacity of 75,000 barrels a day and brings total Richfield delivery capacity to 105,000 barrels a day.

Oil for Today . . . and Tomorrow
THEY CALLED IT A . . .
"Hollywood Refinery"
Impressed by the glistening glamour of the new petroleum installations at Salamanca, a U. S. writer hailed it in a noted news magazine as a "Hollywood Refinery."
But, this ultra-modern plant of Petroleos Mexicanos (PEMEX) is no mere showpiece. Its output: 30,000 barrels of highest quality petroleum products daily. Its cost (with the over-the-mountains pipeline that supplies it): $37,000,000, all of it financed out of PEMEX income.
. . . Just one of the new installations with which, along with others, Mexico has more than doubled its refinery runs: part of the unceasing effort to assure Mexico, and its customers around the world, abundant oil—for today . . . and tomorrow.
PETROLEOS MEXICANOS
MEXICAN PETROLEUM ADMINISTRATION

IT TAKES THE

BEST OF EVERYTHING

TO MAKE

Ⓐ COUPLING

For longer, more dependable
sucker rod service,
specify Axelson
Sucker Rod Couplings.
Ask an Axelson expert.

XELSON

THERE IS NO ECONOMICAL SUBSTITUTE FOR QUALITY

PETROLEUM EQUIPMENT SUPPLIERS ASSOCIATION MEMBER

First Choice

AXELSON MANUFACTURING CO. • PLANTS—Los Angeles 58; St. Louis 16 • OFFICES—New York City 7; Tulsa 1; Buenos Aires, Argentina; Caracas, Venezuela • DISTRIBUTORS—Jones & Laughlin Supply Co.; Great Northern Tool & Supply Co.; Industrial Agencies, Ltd., San Fernando, Trinidad, B.W.I.; Industrias Waldrip & Campbell, Barcelona and Maracaibo, Venezuela; Dominion Oil Field Supply Co., Ltd., Calgary, Canada; South American Supply Co., Avenida Tacna 592, Lima, Peru.

New Director for Fina

C. M. Merrick, who recently retired as managing director of Shell Mex and B. P. Ltd., has been appointed a director of Fina Petroleum Products, Ltd.

New Field in Mexico

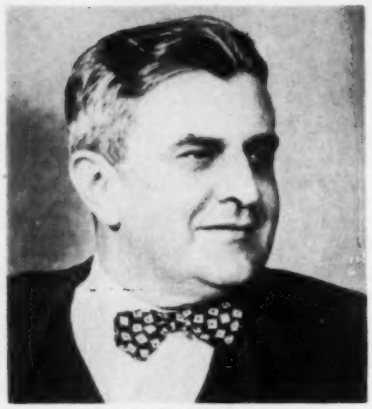
Petroleos Mexicanos has opened a new field about 15 miles from Mascupana, State of Tobasco, between the Fortuna Nacional and Belem fields. The discovery is known as Jose Colombo No. 1. A second location has been staked 400 feet down the Chilapa River, the rig being skidded from the site of No. 1. Two additional rigs will be brought in for development drilling.

The new wildcat was drilled on a seismograph high mapped by American Exploration Co. of Houston. The well was drilled to 5,350 feet and Pemex technologists believe that there is a pay zone about 560 feet thick. Preliminary estimates are that the field will have a reserve of 420 million barrels and an area extent of 25 square kilometers.

Current production of the well is 1,900 barrels of high gravity crude through a 7/16-inch choke. Production is being moved partially by barge and partly through a three-inch line to the Fortuna Nacional field. This line previously was used for gas. It is planned to lay a special line to the El Plan field about 100 miles distant when pipe becomes available. The first well was drilled to the pay in 62 days.

Fluor Promotes Three

Robert L. Merrick, former manager of engineering, has been appointed manager of engineering and construction of the Fluor Corporation, Ltd., Los Angeles. New appointments also went to John Marshall and Frank G. Crawford. Mr. Marshall becomes the manager of engineering, while Mr. Crawford assumes the duties of chief engineer-mechanical. At present Mr. Crawford is the project manager for the Atomic Energy Commission's plant being built by Fluor at Arco, Idaho.



Hector B. Boncher

Boncher Elected Dresser Vice President

Hector P. Boncher, general manager, Dresser Manufacturing Division, was elected a vice president of Dresser Industries, Inc. at the annual meeting. Other officers of Dresser re-elected were H. N. Mallon, president; J. B. O'Connor, executive vice president; R. E. Reimer, vice president, secretary and treasurer; C. Paul Clark, vice president; Arthur R. Weis, vice president; M. H. Nelson, assistant secretary and assistant treasurer.

Book Review

Practical Oil Geology by Dorsey Hager, sixth edition, published 1951 by McGraw-Hill Book Co., New York, 466 pages, $5.50.

This is a handbook designed to present oil men with clear, concise statements on the occurrence of oil, and its geology. The subject of petroleum geology in relation to prospecting for oil has been expanding rapidly, in an effort to keep it up with the times and to cover new developments, the author has assembled the latest thoughts of numerous specialists on modern well-logging methods, a new discussion of folded strata, and a re-examination of deep basin oil areas in the U. S.; well sampling, the latest in paleotectonics, a method of evaluating the gas and oil potentials of geological provinces, and methods of subsurface mapping. Along with basic material carried over from previous edition the revised handbook should continue its usefulness for study and handy reference. Copy of this volume may be obtained from the Book Dept. WORLD PETROLEUM, 2 West 45 St., New York 19.

Power Operated Lubricated Plug Valve Manual

A colorful new manual packed with piping, wiring, mounting, and installation data for power operated Nordstrom lubricated plug valves has been issued by the Rockwell Manufacturing Co. This bulletin is the first complete compilation of technical data covering the use of pneumatic, hydraulic and electric operators for lubricated plug valves. Copies of bulletin V-214 can be obtained by writing Rockwell Manufacturing Co., 400 North Lexington Ave., Pittsburgh, Pa.

El Ebano Drilling

Weigand Brothers, of San Antonio, Texas, who are now working the El Ebano field under a contract with Pemex, have completed their 25th well in Mexico, it was announced by Roy Snodgrass, drilling superintendent. Snodgrass said that out of 25 holes put down, 19 have been producers, averaging 25 barrels daily. The company's contract provides for the U. S. drillers to foot all drilling bills. All production goes to Pemex which in turn pays Weigand 50 U. S. cents per barrel over a ten-year period.

Venezuelan employee operating drilling rig—A Shell photograph

If ROPE could talk...

. . . . it would voice some protest about the stresses and strains it suffers. For remember—although most rope is made to stand a fair amount of rough usage—there is a limit to its endurance. Using the correct rope for the job makes a lot of difference—and that is where British Ropes Limited can help. Why not consult them?

BRITISH ROPES LIMITED

BRITISH ROPES LIMITED

Licensed to use the A.P.I. monogram for Wire Rope

Head Office:
Doncaster, England. Oilfield Rope. Sales Office: 52, High Holborn, London, W.C.1, England.
Telephone: Chancery 8822. Telegrams: Britrope, London.
New York: 18, South St. P. O. Box 195, Montreal 175, St. Joseph St., Lachine, Quebec

How Much Power
do you need
TO PUMP OIL?
...a Westinghouse Dynagraph will tell you exactly!
The Dynagraph is an entirely self-contained, mechanical load-recording instrument. With it you can determine the exact horsepower required to pump an oil well so that you can order precisely the right motor for the job. In addition, the Dynagraph is used to ascertain reasons for motor failures.
The Dynagraph can be operated by one man and no external power is needed. An important advantage of this instrument is that it records in two ways—through tension when mounted below crossarm, or, through compression when mounted above crossarm, when there's insufficient room between crossarm and stuffing box. Two models are available, for 1¼" polished rod and for 2" polished rod.
For full information write today to Department H, Westinghouse Electric International Company, 40 Wall Street, New York 5, U.S.A. Ask for Booklet B-3707.
YOU CAN BE SURE
...IF IT'S
Westinghouse
WESTINGHOUSE ELECTRIC INTERNATIONAL COMPANY
40 Wall Street, New York 5, U. S. A.

Oil Conditions in Burma

(Continued from page 52)

to India and elsewhere. Now, although the oil interests concerned were prepared and able to rehabilitate the industry on the pre-war basis, civil and industrial unrest in the country, the latter encouraged by the extreme left wing policies of most of its leading politicians, has rendered this impossible. Signs are not lacking, however, that the Burma government may be able to restore peace in the country and restore the confidence prerequisite to any successful rehabilitation.

In the case of India and Pakistan, it would appear that the companies' prospects regarding future development are politically brighter than in Burma. The territories are large and the possibilities of obtaining commercial production are by no means negligible. New leases are subject to the proviso that the governments have the right to require the association of indigenous capital with the enterprise, in Pakistan up to a total of 30 percent.

Meanwhile, the greater part of Burma, India and Pakistan's requirements of refined products are being supplied from outside sources.

Imports for the first six months of 1950 were as follows:

India	1,493,800 tons
Pakistan	435,800 tons
Burma	63,300 tons

"An Den Dere Will Be Hell"

The Accelerator, house magazine of the Commonwealth Oil Refineries, Ltd., Melbourne, recently recorded the reaction of D. G. Westgate to recent news articles which have stated that the earth is warming up. Remembering the story of the colored parson who feared that the world will sizzle when oil men have completed the job of robbing the earth's axles of the oil to keep them cool, Mr. Westgate produced the following amusing rhyme:

'AN DEN DERE WILL BE HELL'

Dere's some folks claims dere ain't no Hell
Like the good Lord's Book do say;
But all you people listen well,
To what I preach dis day.

'Cos Brethren, I'm just going to show,
To all dem foolish liars,
Dat dere'll be hell down here below,
Just everlastin' fires.

When de Good Lord made this world go round,
By constantly rotatin'
He put some oil down in de ground
To serve for lubricatin'.

He put dat oil deep in de ground,
An' put an awful lot,
So while dis world goes round and round,
Its axis won't get hot.

Den rich folk come and dug a well,
And found de good Lord's store;
Dey took that oil away to sell,
An' searched around for more.

An' so dey've gone on day by day,
Since de time dey dug dat well,
Dey've took de good Lord's oil away,
An' dey sure will give us hell.

'Cos pretty soon dey'll have de lot,
Dey shows no moderation,
An' den dis world will get red hot,
From lack of lubrication.

An' so, dear folks, dis truth I tell,
Dere soon must come a day,
When on dis earth dere sure be hell,
When de oil's all took away.

Book Review

Natural Gas and Natural Gasoline, by R. L. Huntington; published 1950 by McGraw-Hill Book Co., New York, 598 pages, $8.00.

In the main this book is a text for engineering students taking courses dealing with the production of natural gas from crude oil, condensate, and dry gas fields. the manufacture of liquefied petroleum products, and the aim of the author has been to cover the subject with the thoroughness its importance demands. The treatment begins with estimation of gas and gasoline reserves, and proceeds to plant location and design, gathering raw gas and return of residue gas, recycling efficiencies, absorption, distillation and fractionation, gas dehydration, storage, transportation, and high-pressure pipe-line research. Appendices give properties of hydrocarbons, testing methods, and other useful aids. Copy of this volume may be obtained from the Book Dept. WORLD PETROLEUM, 2 West 45th Street, New York 19.

Worthington Argentina Appointment

Walker J. Wallace, formerly far east regional manager, has been named vice president and general manager of the Argentina branch of Worthington Pump and Machinery Corp., according to an announcement by S. Riley Williams, vice president in charge of foreign business for Worthington.

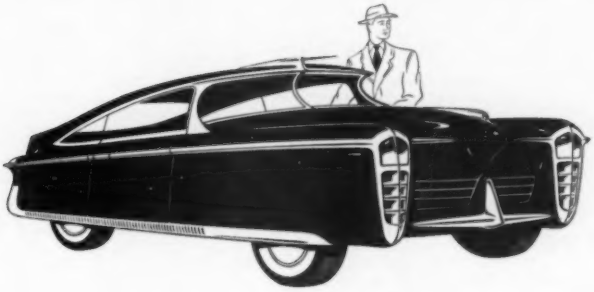
New Drilling Contractor

The New England Fuel Co., of Tampico, Mexico, has reached an agreement with Petroleos Mexicanos for drilling on a percentage-of-production basis. This company, formerly owned by Pablo Bush, of Mexico City, was sold last year to Neville Penrose, Forth Worth, Texas, oil operator who is president of the Good Neighbor Commission. No details of the contract have been made public.

Only one minute after they drive away . . . deaf to further orders, to an urgent change of plans, to a few words which could save precious time and money. If only you could have spoken . . . Well, now you can, at any time, at once, to your transport and your oilfields—with a G.E.C. V.H.F. Radio Telephone. You can have literally your own private two-way Broadcasting Station: and the vehicle installations can also be used as a public address system. A good set this, compact, utterly reliable and as simple to work as a telephone—built with all the enormous technical skill of the General Electric Company. The G.E.C. Radio Telephone won't stop emergencies turning up, but it will give you an entirely new power in handling them. *Please write today for full particulars.*

THE GENERAL ELECTRIC CO. LTD. OF ENGLAND • MAGNET HOUSE • KINGSWAY • LONDON WC2 ENGLAND

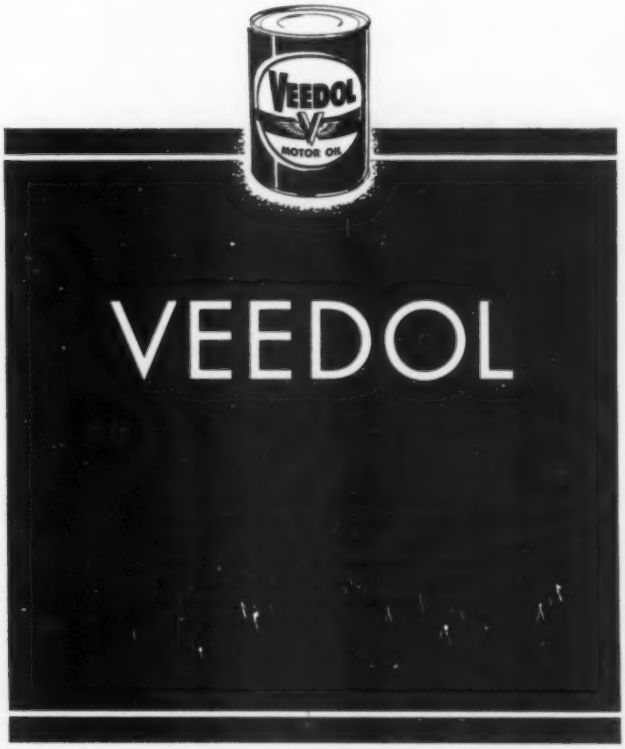
Advanced Panoramic Sports Sedan designed by Richard Arbib for the VEEDOL "Dream Car" Salon



FOUND

WHEREVER FINE CARS

TRAVEL



TIDE WATER ASSOCIATED OIL COMPANY

ADVERTISERS INDEX

(Advertising Agencies in Italics)

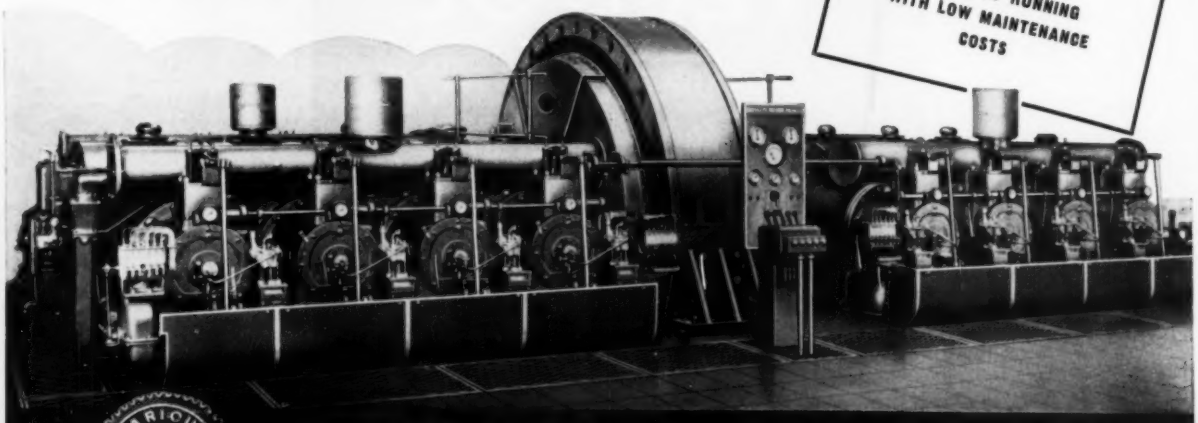
Anglo-Iranian Oil Co. 67
S. H. Benson Ltd.
Audley Engineering Co. Ltd. 63
Axelson Manufacturing Co. 83
Heintz & Co.
Bechtel Corp. Third Cover
Ryder & Ingram, Ltd.
British Ropes Ltd. 84
D. J. Keymer & Co. Ltd.
Burton, Delingpole & Co. Ltd. 21
S. H. Wright & Co. Ltd.
California Texas Oil Co. 73
Cunningham & Walsh, Inc.
Chicago Bridge & Iron Co. 1
Russell T. Gray, Inc.
Crane Co. 81
The Buchen Co.
Crossley Premier Ltd. 88
Osborne-Peacock Co. Ltd.
Davison Chemical Corp. 6
St. Georges & Keyes, Inc.
Dikkers & Co. 5
Nederlands Reclame-Adviesbureau Ir J. Bauduin
English Electric Co. 23
Service Advertising Co. Ltd.
Foster-Wheeler Corp. 71-72
Albert Frank-Guenther Law, Inc.
General Controls 74
Hixson & Jorgensen, Inc.
General Electric Co. Ltd. of England 86
Greenly's Ltd.
Geolograph Co. 74
Lowe Runkle Co.
Gulf Oil Corp. 16
Young & Rubicam, Inc.
Halliburton Oil Well Cementing Co. 30
Lannan, Sanders & Christopher, Inc.
G. A. Harvey & Co. Ltd. 65
Gordon Hargrave & Co. Stuart Advertising Agency Ltd.
Hayward Tyler & Co. Ltd. 28
Arks Publicity Ltd.
International General Electric Co. 75
Grant Advertising Inc.
International Harvester Export Co. 4
McCann-Erickson Corp.
International Paints, Ltd. 80
Mayfair Advertising, Ltd.
International Petroleum Consultants Ltd. 70
Frank R. Cole, Advertising
M. O. Johnston Oil Field Export Corp. 15
Dozier, Eastman & Co.
M. W. Kellogg Co. 17-20
Gordon Baird Associates, Inc.
Wm. Kenyon & Sons 77
Rowlinson-Broughton
Lake & Elliot Ltd. 68
Lane-Wells Co. Second Cover
Darwin H. Clark Co.
London & Midland Steel Scaffolding Co. 53
S. H. Wright, Ltd.
Lummus Co. 13
Harris D. McKinney Organization
Arthur G. McKee & Co. 3
Meermans, Inc.
Moon Brothers 55
Donald MacDonald Advertising Ltd.
Newman Hender & Co. Ltd. 2
Nordstrom Valve Division 63
Marsteller, Gerhardt & Reed, Inc.
Petroleos Mexicanos 82
Pyrene & Co. Ltd. 10
Nelson Advertising Service, Ltd.
Rice Hotel 76
Ritchie Advertising Agency
Shell Development Co. 8
J. Walter Thompson Co.
Sinclair Oil Corp. 26
Doremus & Co.
Sydney Smith & Sons Ltd. 57
S. H. Wright & Co. Ltd.
Socony Vacuum Oil Co. 12
Compton Advertising, Inc.
Spirax Manufacturing Co. 78
Harry Dawson Advertising
Standard Oil Co. (New Jersey) 61
McCann-Erickson, Inc.
Standard Vacuum Oil Co. 79
Sam J. Gallay Co.
Stone & Webster Engineering Corp. 69
Harold Cabot & Co. Inc.
Sun Shipbuilding & Dry Dock Co. 22
Benjamin Eshleman Co.
Tide Water Associated Oil Co. 87
Lennen & Mitchell, Inc.
Timken Roller Bearing Co. 7
Batten, Barton, Durstine & Osborn, Inc.
United Steel Companies 9
Rowlinson-Broughton
Universal Oil Products Co. 24-25
Simmonds & Simmonds, Inc.
Western Geophysical Co. 59
L. J. Swain, Advertising
Westinghouse Electric International 85
National Export Advertising Service
Whitt & Chambers Ltd. 27
S. H. Wright & Co. Ltd.
Woodfield Hoist & Associated Industries, Ltd. 11
Wyatt Metal & Boiler Works. Fourth Cover
Wallace Davis & Co.
Youngstown Sheet & Tube Co. 14
The Griswold-Eshleman Co.

CROSSLEY-PREMIER

DIESEL ENGINE GENERATING SETS

9 engines totalling 13,200 B.h.p. operate the Bremang Gold Dredging Plant. One of the two latest is illustrated below

SLOW SPEED, MULTI-CYLINDER HORIZONTAL VIZ-A-VIZ ENGINES ASSURE RELIABILITY FOR LONG CONTINUOUS PERIODS OF RUNNING WITH LOW MAINTENANCE COSTS



VARIOUS TYPES AND SPEEDS FROM 10 TO 3000 B.H.P.

CROSSLEY-PREMIER ENGINES LTD. SANDIACRE Nr. NOTTINGHAM

LONDON OFFICE: LANGHAM HOUSE. 308 REGENT STREET. W.1.

P79

Thermofor Catalytic Cracking Unit for Socony-Vacuum Oil Company, Inc.

Whatever the type, size and location of your next refinery job, Bechtel resources and experience are available to design and build—***with your engineers,*** or as a completely integrated service—

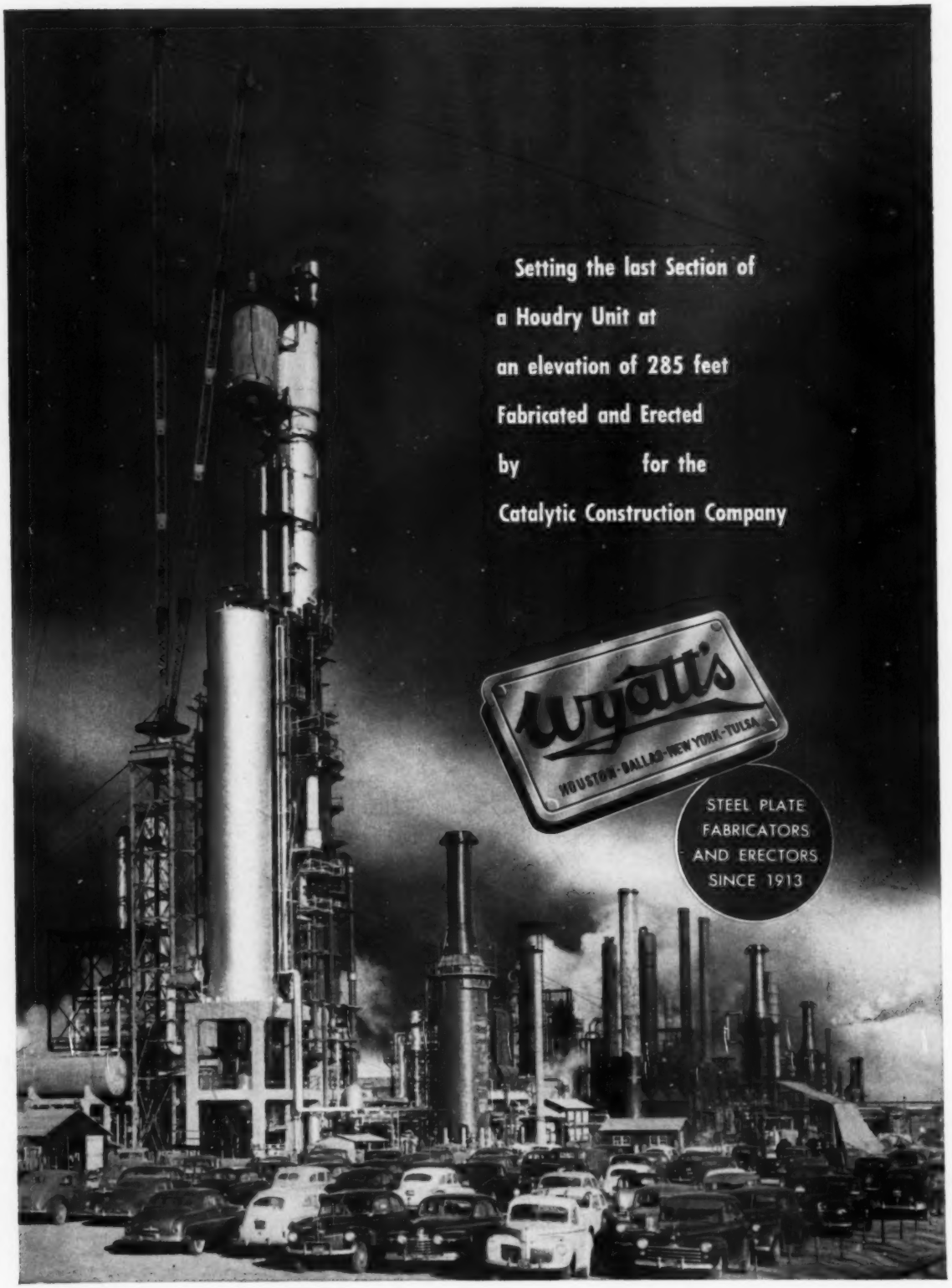
process design to operating plant.

BECHTEL CORPORATION

Los Angeles • **SAN FRANCISCO** • *New York*

"BUILDERS FOR INDUSTRY"

DESIGN • ENGINEERING • PROCUREMENT • CONSTRUCTION


Setting the last Section of
a Houdry Unit at
an elevation of 285 feet
Fabricated and Erected
by for the
Catalytic Construction Company
Wyatt's
HOUSTON-BALLAD-NEW YORK-TULSA
STEEL PLATE
FABRICATORS
AND ERECTORS
SINCE 1913